THE BRICKBVILDER

DEVOTED TO THE INTERESTS OF ARCHITECTVRE IN MATERIALS OF CLAY

PUBLISHED MONTHLY.

85 WATER STREET, BOSTON, MASS.

VOLVME FIVE

JANVARY MDCCCXCVI

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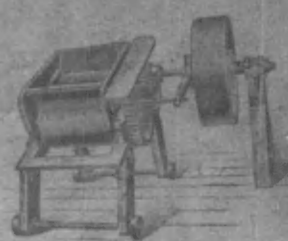

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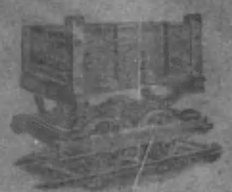

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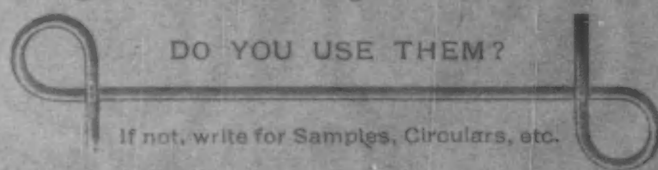

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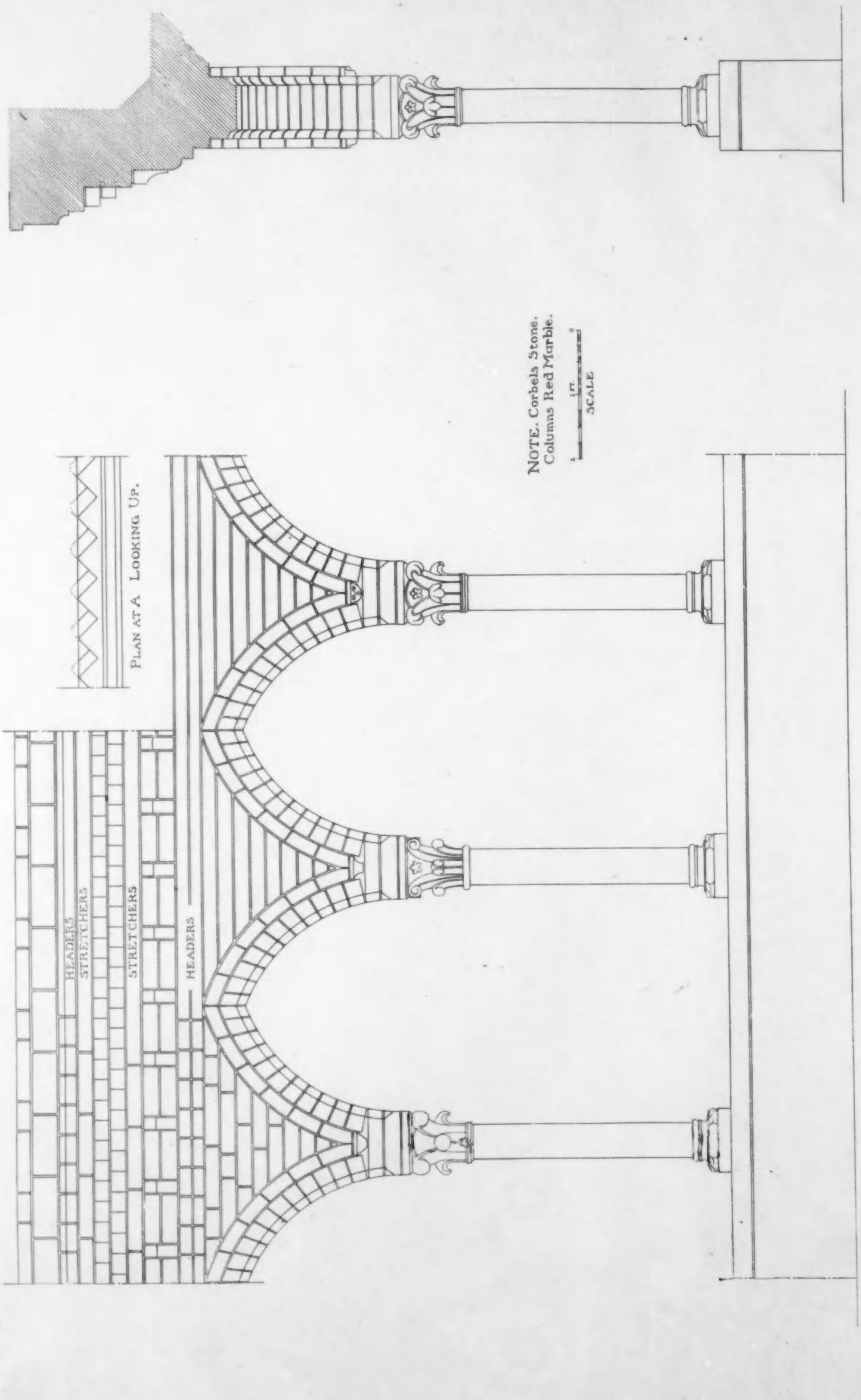

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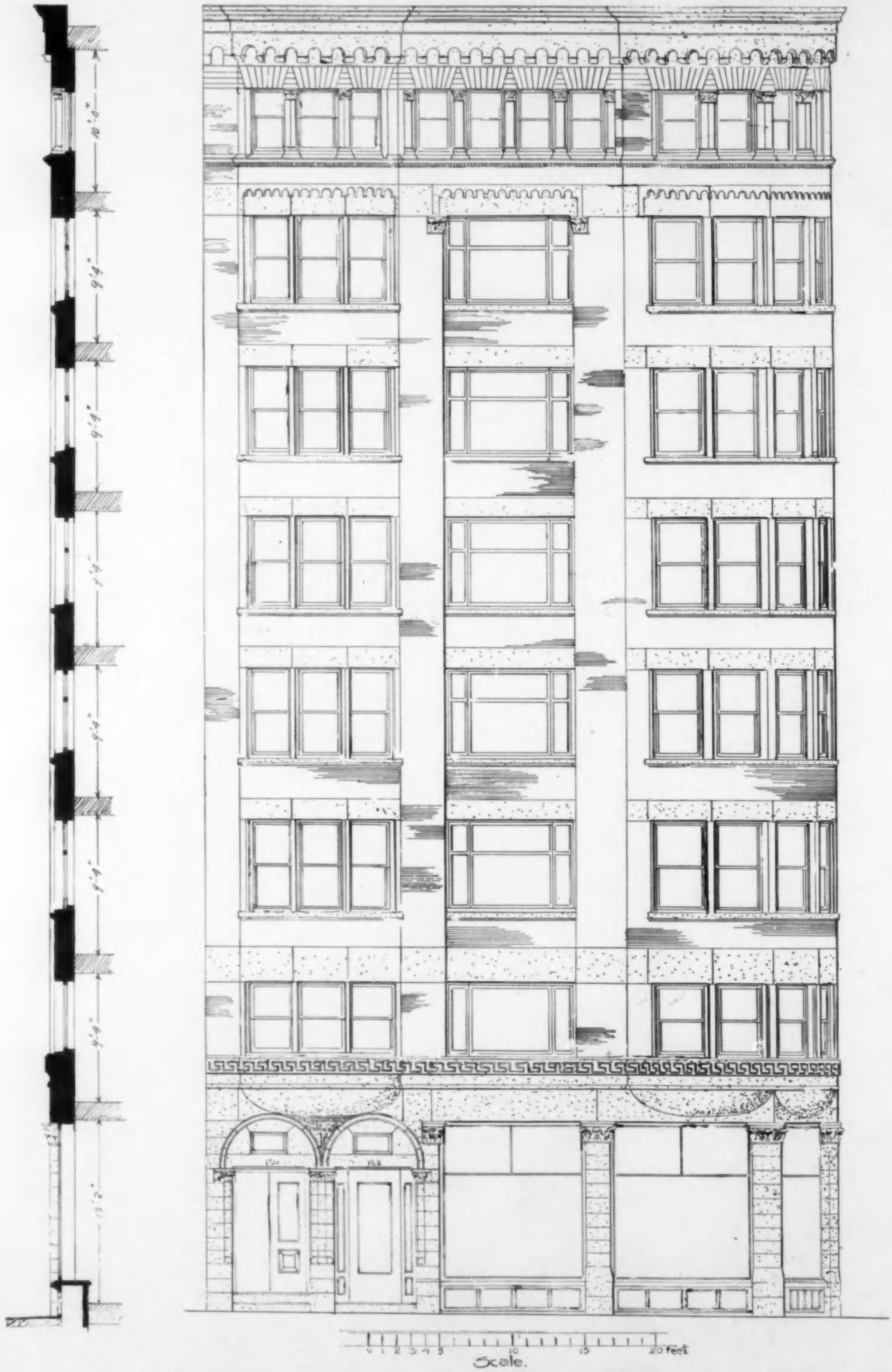

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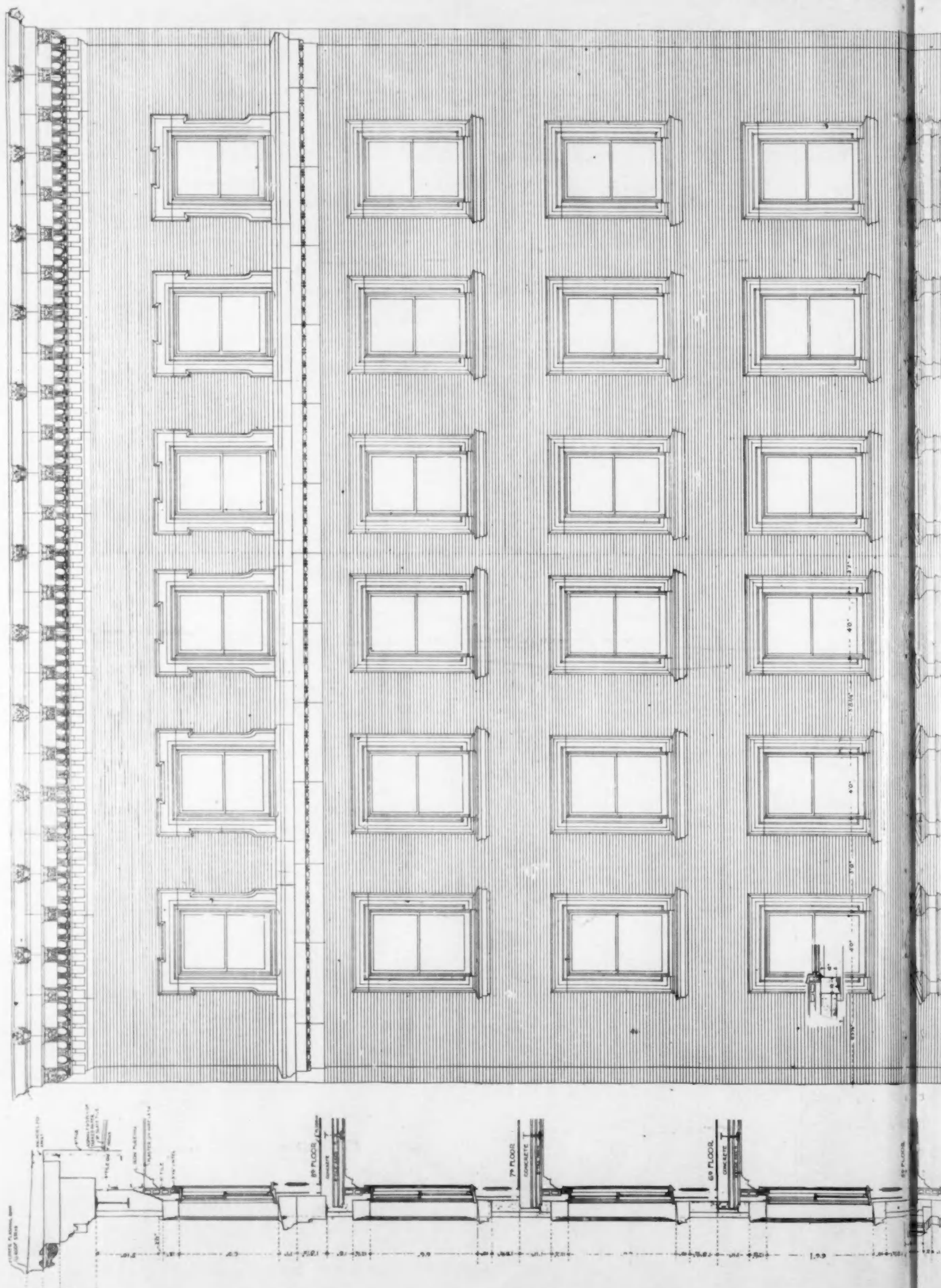

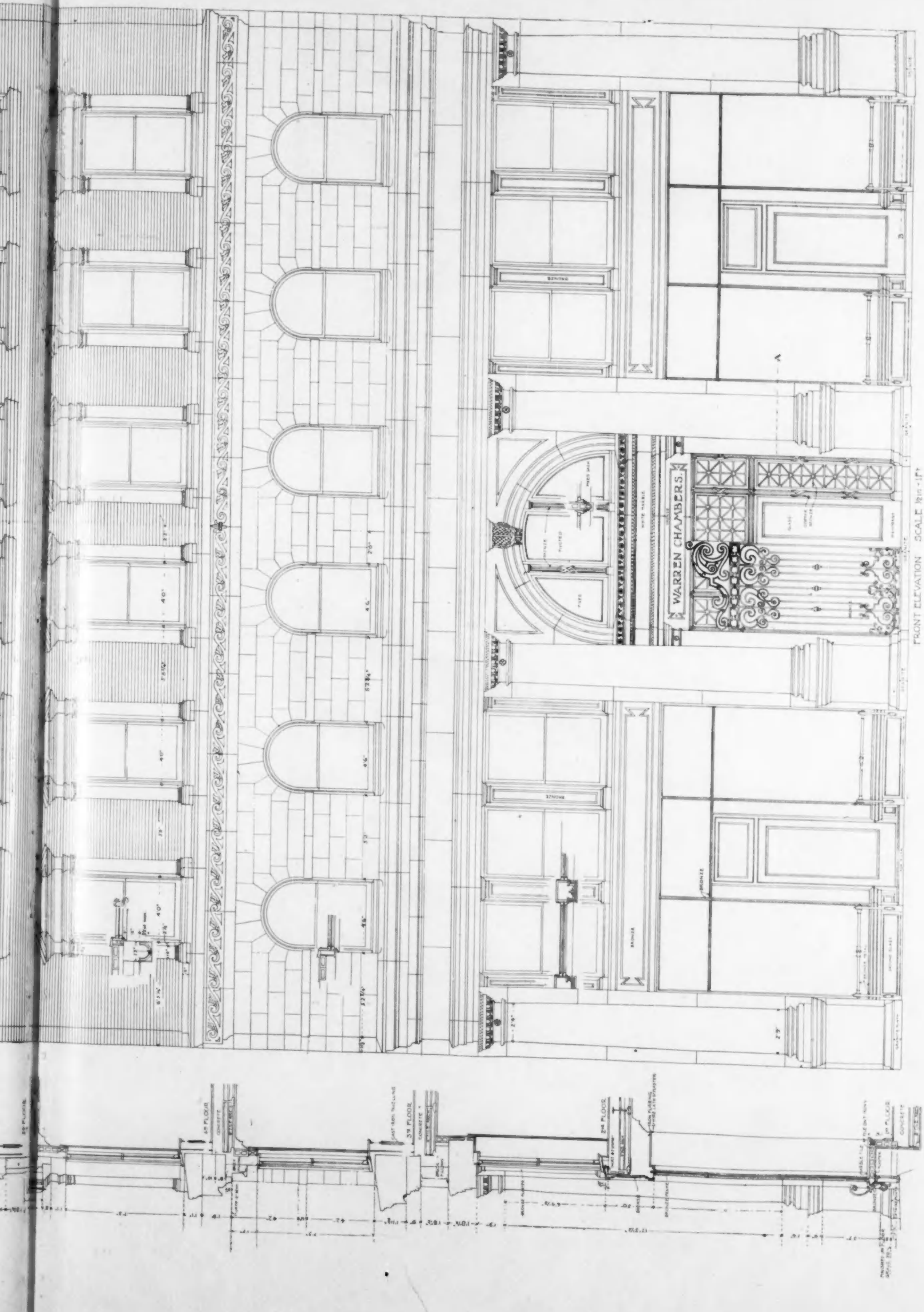

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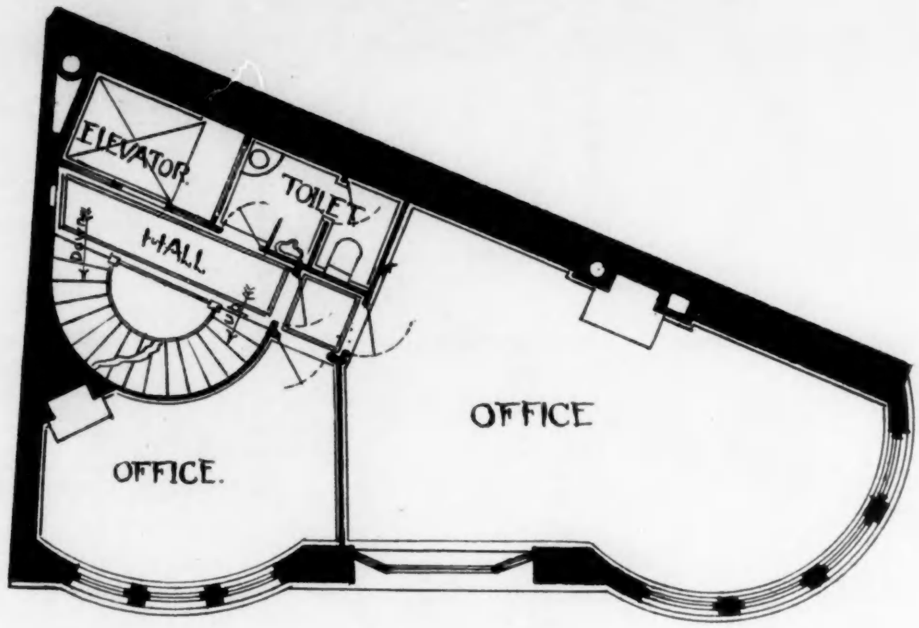

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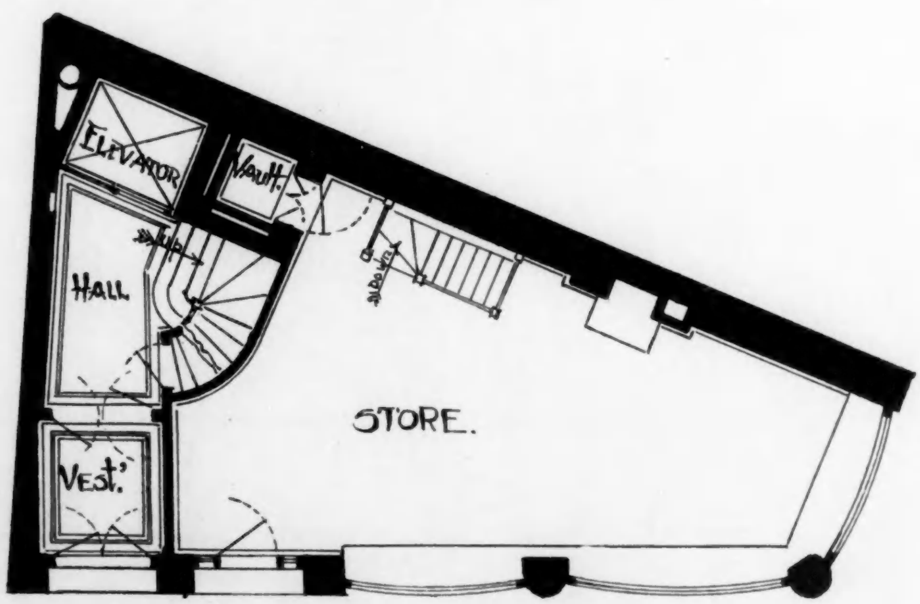

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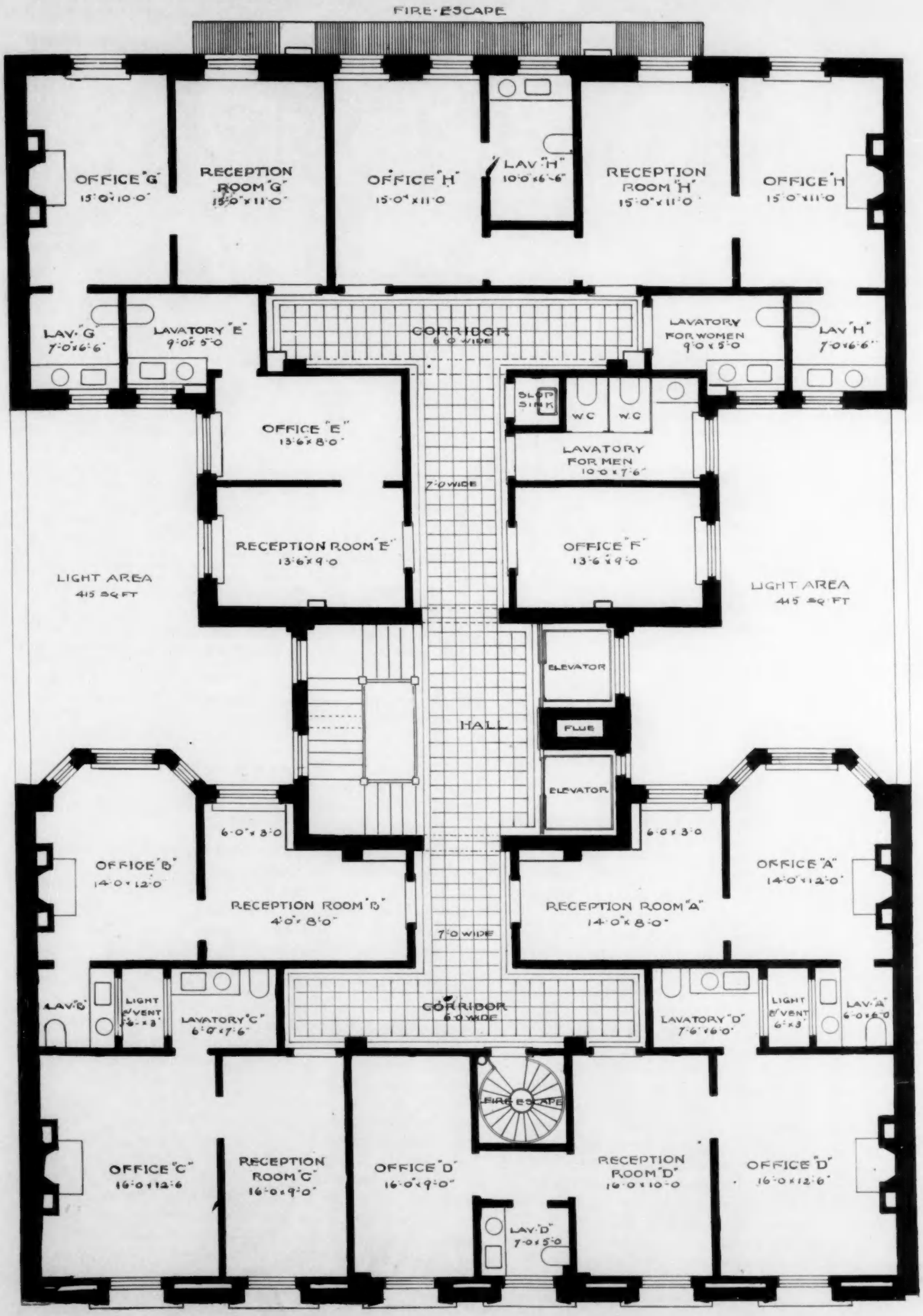

WARREN CHAMBERS, BOYLSTON STREET, BOSTON. Typical Floor Plan.

BALL & DABNEY, Architects.

VOLVME V JAN. 1896 No. 1

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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THE IMPORTANCE OF QUALITY IN ARCHITECTURAL CLAY PRODUCTS.

THERE is a time-honored and somewhat time-worn commercial maxim which says that competition is the life of trade. This was very true in the early days, when business methods were limited by so many practical considerations, and the market far exceeded the supply, but in the latter days of this busy century, where the struggle is so keen and the rewards so precarious, competition may be the life of trade, but it is the life which destroys by wearing itself out in fruitless attempts to rise. Indeed, in many lines to-day competition is almost synonymous with evil results. By this we do not mean that competition of itself is an evil, but the kind of competition which seems to almost inevitably arise in nearly all of the manufacturing lines tends in most cases to diminish the quality of the product and the possible profits of manufacture in almost exact proportion to the extent to which competition is carried. Given the inherent qualities of human nature, together with the possibilities which machinery has placed within the hands of eager competitors, and competition in nine cases out of ten will result in a cheapened product or bankruptcy. We have only to look around on the numerous business wrecks to see how true this is. The burnt clay industries have been until quite recently in a measure free from the ruinous competition which has affected nearly every line of manufacture, but we are now threatened with an accumulation of the same troubles which in the past wrought so much havoc in manufactured products. This is apropos of the circular recently issued by the chairman of the executive committee of the National Association of Fire-Brick Manufacturers, calling attention to the steady decline since 1893 in the prices which could be obtained for burnt clay products, and urging the desirability of cooperation or combination in some form which should stop the continued cutting of prices.

At first thought this suggests monopoly, and the political economist will hold up his hands and say the remedy is worse than the disease. And yet we question whether a little careful thought will not convince any one that under existing conditions the only hope either for profits or for good work is in some form of combination, which, either by restricting the product within legitimate limits or by increasing the capabilities of the manufactured article, will leave a larger margin to be devoted to the betterment of the intrinsic value of the manufactured articles.

IN these times of low prices, when competition waxes hot among manufacturers and buyers have it pretty much their own way, it is of special importance that the quality of architectural clay productions be most carefully considered. It is sometimes said that every man is in business for the money that can be made, whether it be manufacturing or buying and selling. This is not strictly so, or, at least, there are other aims and ambitions which animate men's minds. For instance, two men commence business. Each writes upon his banner the motto, "First quality goods, always reliable."

One looks upon his motto as a pledge to his customers to be sacredly kept by him through all the vicissitudes of business. Sharp competition comes upon him; he knows that his competitors are under-selling him, and he knows also that they do it by lowering the quality, and, therefore, the cost of their production. To meet them he lowers his price to barely cover the cost, looking to the future improvement of business for his reward, but he keeps the quality of his goods to the standard which he has set, and if he is driven to cut to the level of cheaper goods he gives the buyer the benefit of the quality, and stands the loss himself. In other words, he values the reputation of his goods higher than he does a few more dollars made in the business.

The other looks upon his motto as a device for catching trade; he talks very enthusiastically about the quality of his goods, and when he cuts the price in order to secure the largest orders he has much to say about improved methods, known only to himself, which enables him to under-sell his competitors; but all the time his aim is to cheapen the cost, not only (as is proper) by improved methods, but also at the sacrifice of thoroughness in the manipulation of his clay, or by the introduction into his mixtures of material which is especially cheap, but tends to lower the quality of the goods, or if he is a buyer and seller, he makes it his object to buy the very cheapest goods he can find in order that he may under-sell his competitors; anything will do if it is only cheap.

These two, perhaps, are extreme cases, but they illustrate two distinct policies which actuate manufacturers and material men, as well, perhaps, as those in every other line of business.

A manufacturer of sewer pipe was asked not long ago why he did not sell his goods as low as some of his competitors. "I will tell you why," said he; "they grind their clay fifteen minutes; I grind mine twenty-five." That additional ten minutes cost him something in steam power, wear and tear, and in labor, but, as he said, it appeared in the superior quality of the goods. The great aim of many

clay machinery men in these times appears to be to offer to the manufacturer some new device which shall enable him to cheapen his product, and too often the question of the quality of that product has been overlooked in the anxiety to save something in the cost, that a low selling price may be made.

There is no class of manufacture where the quality should be considered more carefully than in architectural clay products. The material itself, when properly manufactured, is indestructible. It is made for all time, and a few dollars saved at the outset, at the expense of quality, is really a much larger sum thrown away.

The irresponsible "agent," whose chief object is his commission, and who is so ready to promise and even "guarantee" anything which the buyer demands, is sure to involve not only his principal but his customer, also, in serious trouble. The manufacturer whose price is considerably below those who have been long in the business and thoroughly understand it should be looked up pretty carefully before trusted with important work. It may be found that his work is cheap because he employs cheap labor or does not apply to his manufacture that thoroughness of execution which is employed by his higher-priced competitor.

This is by no means an argument in favor of giving work to the highest bidder, but simply to emphasize the fact that the goods that are the cheapest in price are not necessarily the goods which it is wise to buy. Take the question of discoloration of buff bricks. There have been demands by architects and owners to the effect that buff bricks must be guaranteed not to turn green, and there have been plenty of enterprising "agents," and perhaps some manufacturers, who have been so anxious to make sales that they were only too willing to guarantee their brick not to turn green. The order has been secured. The bricks have been shipped and put into the building, and, lo, in due time the neighbors' goats gather round and trample each other in their efforts to browse off the walls. What can be done? A great deal of growling, some swearing, threats of lawsuits with heavy damage claims, etc., but usually the matter is adjusted without much, if any, claim upon the man who sold the brick. The goats and the weather after awhile clear the building of most of the vegetable matter, leaving it somewhat dirty looking, to be sure, but much better than the owners feared at one time, and the enterprising "agent" goes off and "does it again."

WE have sufficient confidence in the ultimate possibilities of the burnt clay industries to consider them as the most suitable materials for building purposes which the market now affords. We believe that the present extended use of brick and terra-cotta is not the mere passing fashion, but is the beginning of a steady growth which shall be much more extensive in the future than it has been in the past, and which will give employment to a great many manufacturing concerns. But if, however, a system of competition is allowed to exist between the manufacturers by which the prices are forced down below what will give a fair return on the capital invested, the fact that a few concerns will still continue to turn out good work will not prevent a great many more from meeting the cut in prices by a corresponding cut in quality. The prospect of a vastly increased market with a vastly diminished financial return is one that ought not to be tolerated. We would be the last to encourage a monopoly which would stifle legitimate business or would wring vast profits from the helpless consumers. But we do not believe the conditions could ever be such as to render this possible, while, on the other hand, if the manufacturers could unite on common ground, could agree upon some combined action, we believe that the terra-cotta and brick industries would be vastly benefited in the first place, and as an immediate consequence the consumer would get a better material for his money. The amount of money which is annually sunk in useless competition, if applied to bettering the product, would lend a life to the trade such as could not be obtained from any system of cut-throat prices. We believe in cooperation, because, in our judgment, it implies a better product. We do not believe in mere competition, because it is sure to result in cutting the prices and in cheapening the goods. And it is to be hoped that Mr. Homes' excellent circular may be taken to heart by every member of the Association of Fire-Brick Manufacturers, and may result in placing these industries upon a better and more legitimate basis.

JOHN STEWARDSON.

THE death of Mr. John Stewardson, of Philadelphia, is a distinct loss to the architectural profession. He bore so prominent a part in the architectural development of the last few years, and his name has been so thoroughly identified with the best aims of his profession, that, though his place may be filled, his influence will not be forgotten. He was enthusiastic, artistic to the highest degree, a man who viewed architecture not merely as a means of gaining a livelihood, but as an expression of his real, innermost feelings, and one of whom we cannot have too many. It is with the keenest personal sense of bereavement that we are obliged to chronicle his death.

At a meeting of the Philadelphia Chapter of the American Institute of Architects the following minute was adopted: —

"It is with deepest sorrow we have learned of the sudden and untimely death of our friend, John Stewardson.

"In commemoration of his influence among us, we would here inscribe a tribute to his kindly and noble character and his high artistic nature.

"His professional career, though terminated before there was opportunity for the full realization of the promise he gave, did much to raise the standard of architecture in Philadelphia, and his executed work has placed him among the first of American architects.

"While his natural gifts and his attainments made us respect him as an artist, it was his sunny, buoyant nature that drew him to us as a friend. He was ever ready to help, advise, and instruct. He was devoted to his life work yet his sympathies were not limited by it.

"It is impossible to voice the overwhelming sentiment of loss we feel, a loss not alone to ourselves, but to the community in which his work will stand as an enduring monument to his genius."

PLATE ILLUSTRATIONS.

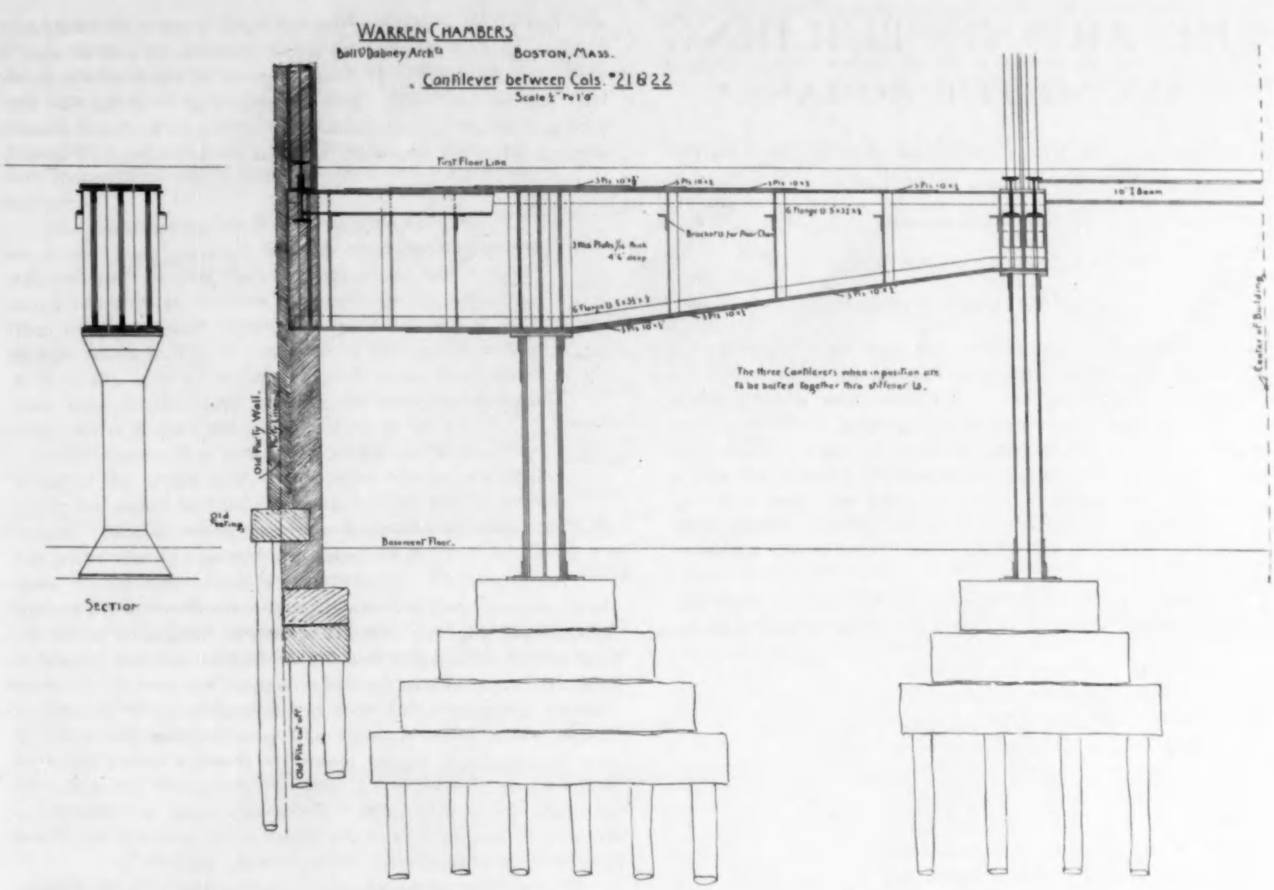
PLATE 1. Measured drawing by Mr. C. H. Alden, Jr., of Cloister of San Francesco, Brescia.

PLATE 3, 4, AND 6. The Warren Chambers is designed for an office building, for the exclusive use of physicians and specialists allied with the profession. The typical floor plan is arranged in suites, comprising a reception room, operating-room, and laboratory. A few of the suites are so arranged that two doctors may have the use of a reception room in common. On the second, fifth, and seventh floors are men's and women's lavatories for general use. The first floor is adapted for stores intended to be occupied by trades related to the medical profession.

The building is entered through a vaulted white marble vestibule and a corridor of sienna and verde antique marble. The elevator hall and staircase on the first floor are of sienna marble, and all the metal work is of bronze, as is the staircase above.

The basement in the rear contains storage space for the stores above, and in the front portion are the boilers and elevator machinery. Under the area in front of the building are the engines and the electric plant, lighted from overhead by sidewalk lights.

The building is entirely ot skeleton construction. The walls, both external and party, are carried by the frame at each floor, as well as the floors themselves. At the first floor level the loads of the wall along the party line rest on the short arms of a series of cantilevers, which transmit them through columns in the basement to a point varying from seven to eight feet from the party line. The cantilevers are counterbalanced at the long arm by the loads from the interior columns. Sufficient space for the proper spread of footings is thus



obtained to enable all foundations to be built entirely within the property lines. The footings rest on clusters of piles and, these being removed from the existing foundations, the settlement of the adjoining property is reduced to a minimum.

PLATES II AND V. The problem to be solved by the architect when called upon to plan and design a building for this site may be stated as follows: How shall a building be put upon a corner lot containing only about 797 sq. ft. of land with one street frontage of 39 ft. 4½ ins., and the other of only 10 ft., so planned as to use the land to the best advantage, and so designed as not to offend the eye, bearing in mind the fact that the land is assessed at a comparatively high price, and that a fair financial return is desired upon the value of the land and the cost of the building proposed?

Consideration of the size and situation of the site showed that an office building was the only kind of building from which a reasonable financial return could be expected, and that in consequence of the value of the land more than six stories of offices would be required to make the total investment pay reasonably well. It seemed that in order to prove attractive to tenants the building must be fitted with such conveniences and finished in such a manner as to compete with the best class of office buildings in the city, and after much consideration this was finally determined upon. As a building of the height finally planned must be of fire-proof construction it was, to save room, decided to use a steel skeleton. These preliminaries being determined, the economical and convenient arrangement of rooms, halls, entrances, elevator, and toilet rooms demanded the most careful study. The projection of bays added materially to the room space, and the bay at the corner of Milk and Broad Streets served the double purpose of increasing rentable space at the point most needed, and at the same time did much to increase the apparent width of the end of the building on Broad Street, and this, it will be seen, was most desirable in a front of really only 10 ft. with a height of eight stories. To save space still further the interior partitions above the first story are built solid of iron lath and plaster and are only 1¾ ins. thick; and in connection with this it will be noticed that the semicircular iron staircase is enclosed with this same sort of thin partition, and the question was what to do with the face of the wall exposed to the stairs. A dado or sheathing of something other than wood or plaster was desirable, both on account of wearing and fire-proof qualities. Marble mosaic laid with small tesseræ seemed to offer the advantages of being noncombustible, durable, and easily conformable to the curved surfaces of the wall and yet thin enough to economize room. To give apparent size to the building it was determined to keep the exterior as light colored as possible, and Milford Park granite, limestone, and a light yellow brick made especially for the building by the Perth Amboy Terra-Cotta Company have been used with a satisfactory result. Before the building was erected doubts were expressed as to whether desirable offices could be planned for such a small lot, and even if the offices were satisfactory from a tenant's point of view, could the rents satisfy the owner? The result at present seems to be that the offices are desirable and the owner will get something better than five per cent. net on the total value of land and building.

WE are desirous of securing back numbers of THE BRICKBUILDER for the following months: May and July, 1893; March, May, June, September, 1894; February and July, 1895. Parties having these numbers, and who are willing to dispose of them at the regular subscription rate, will confer a favor by addressing the publishers of THE BRICKBUILDER.

THE very material increase in our subscription list during the month of January, in addition to the large number of renewals, is a most gratifying indorsement of our work, and will be met by a renewed effort on our part to merit the generous support that is being given us.

THE ART OF BUILDING AMONG THE ROMANS.

Translated from the French of AUGUSTE CHOISY by Arthur J. Dillon.

PART II. CHAPTER II.

VAULTS OF CUT STONE.

IN describing the Roman vaults of cut stone, we will again have to take up a series of methods of construction whose origin was foreign to Rome, but this time it is Etruria from which it comes. All types of vaulted construction were to be found in the monuments erected by the Etrurians or under the direct influence of their civilization; the Cloaca Maximus is an example of a barrel-vault with a curved axis; the Mamertine prison is ceiled by a flat vault; the outlet of the Lake of Alba terminated on the plain in a conical vault on spreading piers; and the lintels of the doors of the theater of Ferrento were flat arches.

Many of these Etruscan vaults, to be sure, are but rude and imperfect attempts, where the inexperience of the builders is shown

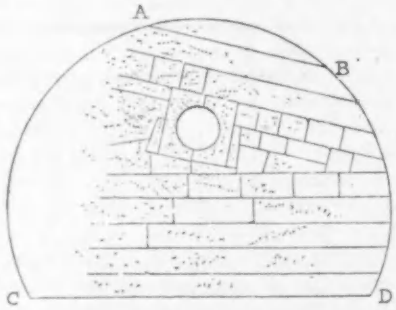


FIG. 75.

by faults such as those in the ceiling of the Mamertine prison (Fig. 75). But in others the arrangement of the stones shows an elegance that approaches an extreme: stones of different form and size alternate in regular order, and their assemblage seems calculated with a view to reduce as far as possible the number of large voussoirs; the arch of Volterra, whose developed extrados is shown in Fig. 76, is a remarkable example of this care in arranging the stones.

It is hardly necessary to recall the place the Etruscans gave to the round arch in their architecture from the earliest times. The ornaments which they attributed to it have been consecrated by tra

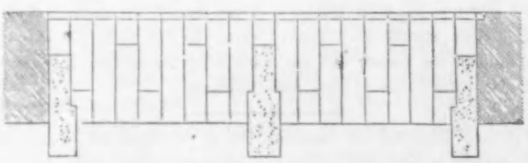


FIG. 76.

dition; the impost, the carved keystone, the archivolt, all the essential members of the Roman arcades are to be found in the Etruscan door of Faleria. The Romans made only insignificant or regrettable changes in this beautiful and dignified motive; their attention was directed entirely toward the methods of construction, and with cut stone, as with rubble vaults, the result of their efforts was the development of a systematized economy.

A first custom, evidently arising from the spirit of economy, was that of using centering for the upper parts of the vaults only, using to hold up the centering salient voussoirs, such as are seen in the bridge of Gard (Fig. 77), the bridge of St. Barthelemy at Rome, etc. All the part lying below the projecting voussoirs was built without auxiliary support; sometimes, to prevent the voussoirs from slipping during the time when there was yet nothing to hold them in

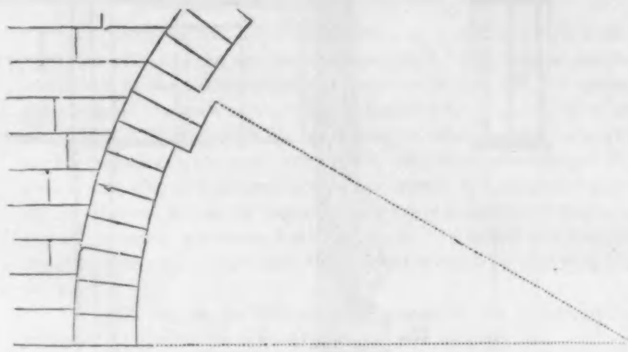


FIG. 77.

place, care was taken to fasten them with dowels and mortises, as in the Coliseum (Fig. 78). Elsewhere, without being able to discover what method was adopted to delay the time when centers would be necessary, we can at least see that no support was used for the stones near the springings; thus there is a Roman vault near the route of Eleusis, whose intrados, rough and unformed near the springing, becomes smooth and regular toward the crown, a certain indication of where centers were used. The rough voussoirs are those that the builder put in place without centering; it was only when it was necessary to rest the keys on the planks of the centering that it was thought worth while to dress and smooth the intrados.

The lower part of the centering thus done away with, the Romans sought to simplify the remainder; so much so that, among the different methods of arranging the stone, that on which their choice rested often offered no other advantage over the others than that it involved the use of a cheaper and less complicated centering; thus it was at the bridge of Gard.

The stones here do not, as in modern vaults, dovetail and interlock; each span is formed of a number of narrow arches in no way bonded together (Fig. 79). All the keys in the same arch have their lower sides of exactly the same length, and the vault is, as it were, divided into contiguous but separate and independent sections.

This interruption of continuity is quickly justified when one considers the ideas which brought it about. What, in fact, was necessary to sustain such a vault? A frame at each end and one at each of the lines between two consecutive arches. No planking was needed; each key B spanned the space between two frames and rested directly on them at its extremities (Fig. 80).[1] All the difficulty lies in making the voussoirs equal, but this is of no importance when the stone is found in such great thick beds as those from which the stone for the bridge of Gard was taken, for then the uniformity of size can be obtained without waste, and it even makes the quarrying cheaper by making it simpler. And it was just where such favorable conditions were to be found that the Romans used the unbonded masonry. Its principal examples are found in the region of the bridge of Gard; one can cite not far from there the arches of the great viaduct crossing the valley of the Vidourle at

[1] This explanation is taken from Viollet le Duc's *Dictionnaire raisonné de l'Architecture Francaise*, Vol. IX., p. 488. Before becoming acquainted with the recent works on the subject where this is described, I supposed that the builders of the bridge of Gard used the same center over and over again, moving it in turn to each of the rings, A, B, C, etc., which compose the vault. But it would be hard to maintain this hypothesis here, for a center of only the width of one of the rings would be too narrow for its span; it would not have base enough, and would probably fail. But, as a general proposition, the idea is well in the spirit of Roman construction, and it is not impossible that it is the true explanation of the construction of similar vaults of smaller span.

Sommieres, the upper vaults in the amphitheater of Arles (Pl. XVII., Fig. 1), those of the arena at Nimes, those of the lateral galleries of the so-called Temple of Diana; and this form of construction was so well suited to the materials of the country that when, in the twelfth century, the bridge of Saint-Benezet of Avignon was built, the architects of the middle ages knew of no better way than that pointed out by these numerous and magnificent examples.

The Romans had then done away with a costly part of the centering, the planking; but they could go still further, and, while still keeping the advantage of the first simplification, considerably diminish the weight on the centering. The expedient which permitted them to do this is well enough shown in Fig. 81; in place of placing the arches A, B, C, etc., so that they touched each other, they placed them some distance apart, covering the interval afterwards with a series of slabs following the curve of the vault.

The economy is evident. The weight on the centering is that of the arches A, B, C; the slabs between are held up by the arches, and the centering gets no part of their weight. In other words, the arches themselves serve as centers, and the advantages of discontinuous masonry are thus combined with those arising from the use of armatures; the planking is suppressed and the pressure on the centering diminished.

This method of construction is found in an ancient monument belonging, like the bridge of Gard, to Roman Gaul, known as the

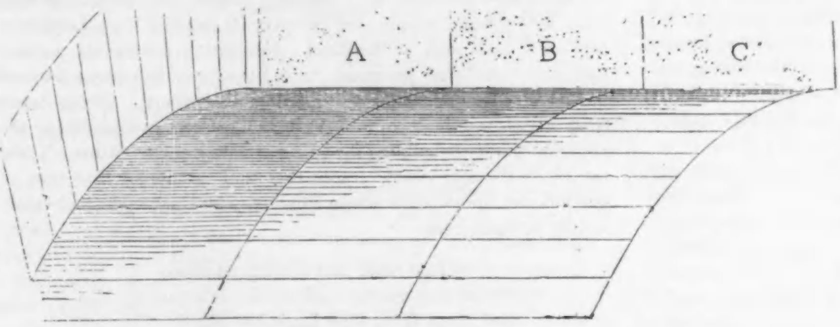


FIG.. 79.

Temple or Baths of Diana at Nimes (Pl. XVI., Fig. 1).[1] The arches which served as centers have on the extrados deeply cut rabbetts into which the ends of the slabs fitted; on the interior these arches are marked by their projection, which is considerable. Their function is thus manifested with the utmost clearness; and the architects, profiting by an arrangement dictated by economy, made from it one of those motives of ornament whose effect is always pleasing, because they arise from the principles of good construction.

This system, which resumes, it might be said, the practical resources of the Roman art, gave rise, in our country and especially in the oriental regions of the Roman Empire, to a variant of considerable importance. I show its character by an example taken from the subterranean vaults of the arena of Arles (corridor on the prolongation of the principal axis of the amphitheater, Pl. XVI., Fig. 3).

Here the slabs between the arches no longer follow the cylindrical surface, but form a sort of platform; each arch carries a little wall, like a tympanum, leveled off even with the crown of the extrados, and the slabs, placed on the horizontal top course of this wall, make a plane surface which can be utilized as the floor of another story; thus there was no necessity of placing a flooring over the vaults for the same slabs served as a ceiling of the lower gallery and as the floor of the rooms above it.

This kind of vault had also another merit,— that of avoiding the

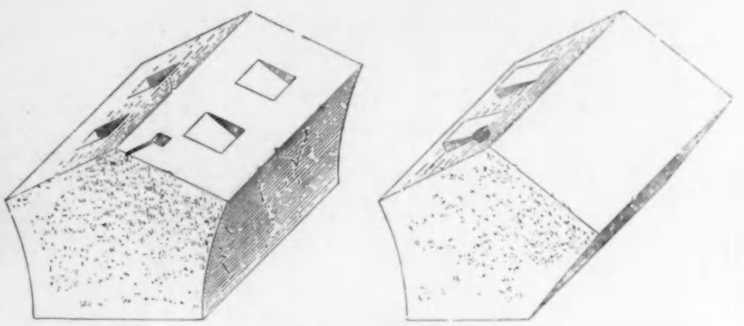


FIG. 78.

difficulties which arise when two rectangular galleries intersect; it was only necessary that their intersection should not interfere with the arches,— that is, that it should be between two consecutive arches. This species of intersection is found in the galleries of the arena of Arles, and other examples are to be seen in the drawings accompanying the work of M. de Vogüé on the Syrian monuments of the first centuries of our era. In Syria the isolated arches carrying horizontal slabs by means of tympanums were widely employed; an entire system of construction, and even a whole system of architecture, is founded on their use; basilicas, with large naves and two-storied side aisles, dwellings, and tombs have their roofs and floors formed of these horizontal slabs carried on isolated arches. The Romans thus obtained light vaults which were perfectly solid, while the expenditure of materials was reduced to a minimum. The tympanums prevented the deformation of the arches and played nearly the same role as the backings of rubble in the vaults described in the first part. Moreover, the thrusts were not difficult to meet, for they were brought to isolated points; to counteract them it was not necessary to exaggerate the thickness of the walls; it was sufficient to place buttresses opposite the arches, and partition walls, made necessary by the plan of the building, often were used for this purpose: in other words, the

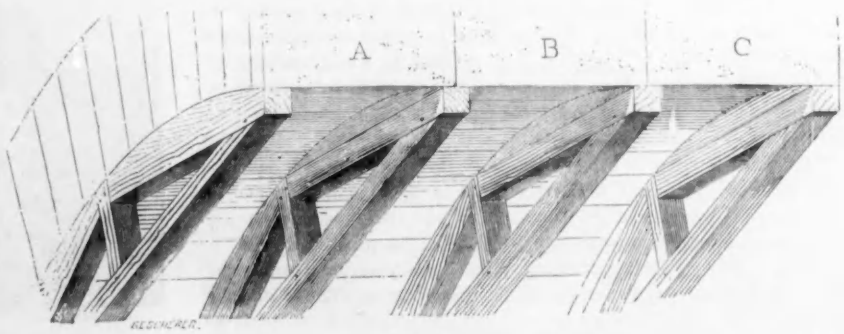


FIG. 80.

exterior wall was no longer the support of the vaults; it was only a screen, which could, without interfering with the solidity of the edifice, be pierced by many openings, whose form and arrangement

[1] The description of the arrangement of the parts of this vault is one of the pieces of information for which I am indebted to M. Aures, engineer in chief. It is to be understood that the sketch (Fig. 81) is not a restoration of the temporary centering of the vault; I do not know whether there was but one center for each ring or two; what seems probable is that there was no planking; what is certain is that the pressure on the centering, whatever its form, was greatly reduced.

were controlled by no exigency of construction. Hence, there was great liberty in the design of the edifices; and hence that mass of original conceptions in the first centuries of our era, in the architecture which the researches of M. de Vogüé have made known to us.

In order to complete this study of vaults with ribs, I should say a few words about a system with which the architects of the bridge of Narni experimented; it would seem that the experiment was not successful, for they abandoned it after having tried it in a single arch

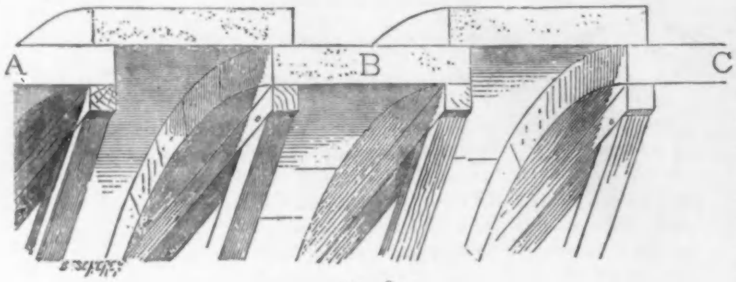


FIG. 81.

at one of the extremities of the bridge (Pl. XIV., Fig. 2 and 2bis, and Pl. XXI.). Here, as in the baths of Nimes, the general appearance is that of a barrel vault with salient ribs, but it would be fruitless to seek the keyed slabs held up by the arches. The stones of which the vault is built dovetail into each other in such a manner that it is impossible to distinguish either armature or covering; it is a barrel vault, probably built course by course, the arches being reduced to ribs bonded into the rest of the construction, adding to its rigidity; its strength is probably equal to that of a solid vault of the same total thickness, while its weight is less; and this is, I think, the principal advantage of the system.

I will not try, however, to justify in all its parts a system which the Romans seem to have been the first to condemn. The difficulties of fitting together all the stones which dovetail into each other surpass or balance the economy of material and of centering resulting from the lightening. This without doubt led them to give up the method, and, warned by this failure against such expedients, they went back, for the three remaining arches, to the ordinary method of barrel vaults with alternating joints.

(*To be continued.*)

OUR TIME-HONORED INDUSTRY.

THERE is no building material so durable as well-made bricks. In the British Museum are bricks taken from the buildings in Nineveh and Babylon which show no sign of decay or disintegration, although the ancients did not burn or bake them, but dried them in the sun. The baths of Caracalla and of Titus in Rome, and the Thermae of Diocletian, have endured the ravages of time far better than the stone of the Colosseum or the marble of the Forum.

THE Park Building at Pittsburg, Geo. B. Post, architect, will have some of the richest terra-cotta detail of any building in the country. Plates 76 and 79 contained in our December number show the elaborate manner in which Mr. Post has employed this material. Later we shall publish some half-tones from photographs of the details made at the works of the Perth Amboy Terra-Cotta Company.

AT the annual election held at the Omaha Builders' and Traders' Exchange, Jan. 6, 1896, the following gentlemen were elected officers.

President, J. Walter Phelps; vice-president, W. C. Bullard; treasurer, W. B. Rutherford; secretary, W. S. Wedge, for five years.

Directors: — M. B. Copeland, Chas. Baxter, Thos. Herd, J. H. Haste, G. H. Kelly, A. D. Harriott.

ARCHITECTURAL TERRA-COTTA.

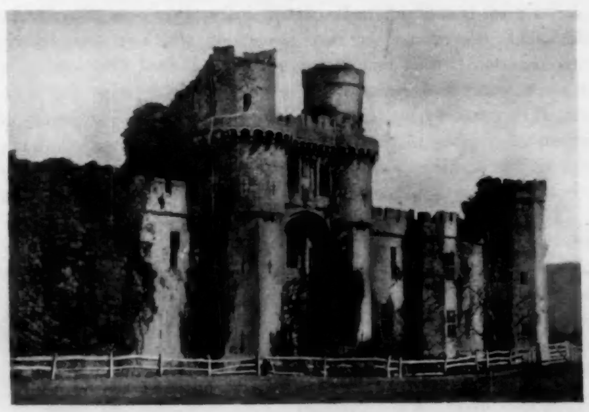
BY THOMAS CUSACK.

THE principal towns of Roman England are said to have been adorned with temples, courts of justice, theaters, statues, baths, and other public buildings,— a colonial imitation, it may be presumed, after the manner of the Imperial City. But to say, as Sir Francis Palgrave does, that "the country was replete with Roman magnificence" is, we think, rather too magnificent a way of stating the fact that the Romans did introduce the art of brickmaking, and that they made very extensive use of bricks in such buildings as they brought into existence. Their influence in every branch of industry was strong and wholesome while it lasted; but, after all, it was an exotic that did not take root sufficient to produce a spontaneous growth. With their exit from the scene of their triumphs in arms and in the industrial arts, the Britons relapsed into their former condition of semi-civilization. The marauding Danes came but to pillage and destroy, and the invading Saxons were no better qualified than the natives to fill the place vacated by the highly trained and masterful Romans. They had been accustomed to houses of roughly hewn wood and rude huts roofed with brambles, and such of the remaining Roman edifices as they did not wilfully demolish, they, by indifference and neglect, allowed to fall into ruin and decay before the time of Bede or the early chroniclers.

A Roman wall still exists in Leicester, an arch in Lincoln, foundations and other traces of their buildings have been dug up in Exeter and Colchester, etc. Watling Street and other highways have been merged into modern coach roads, leading from London to the north and west of England. Interesting remains of pottery, tiles, and tessellated pavement have been found in various parts of the country in the course of building excavations. Bricks taken from the Roman-built town of Verulamium were re-used during the eleventh century in building the adjacent abbey of St. Albans. These are about the only visible traces that now remain of that race of warriors and brickmakers whom Boadicea and Caractacus had vainly sought to expel from

"That pale, that whitefaced shore
Whose foot spurns back the ocean's roaring tides
And coops from other lands her islanders."

The use of stone was traditional with the fortress-building Normans, and likewise in accord with the temperament of a people



HURSTMONCEAU CASTLE, SUSSEX.

whose first article of faith was embodied in the old rule and simple plan, that he who hath may hold, and he may take who can. Yet the sturdy piers, and round arches, and the ornament commonly used in their churches were as well suited to the employment of molded forms as the kindred Romanesque of Northern Italy had proved itself to be. The art of ordinary brickmaking, however,

seems to have been as completely forgotten in England as if it never had existed. It disappeared soon after the departure of its founders, and was not revived again until late in the thirteenth century. Even then it was re-introduced by way of Flanders, and that only in the neighborhood of seaport towns along the east and south coast, which, being the channels of European intercourse, were the first to be influenced by the customs and building methods of other countries. Thus in the town of Hull, then, as now, the chief port of entry for shipping from the Baltic, we find in *Leyland's Itinerary* that "Michael de la Pole, merchant of Hull, came into such high favor with King Richard II. that he got many privileges for the towne. And in hys tyme the towne was wonderfully augmented yn building and was enclosyd with ditches the waul begun and in continuance endid and made all of brike as most part of the houses of that time was. In the waul be four princepal gates of brike. M. de la Pole builded a goodlie house of brike against the west end of St. Marye's Churche, lyke a palace with goodly orcharde and garden at large, also three houses besides, every one of which hath a tower of brike." Trinity Church, Hull, is likewise referred to by Street as being one of the few examples of good brickwork in England of a date prior to the fifteenth century.

The terra-cotta used in the manor house of East Barsham and the parsonage Great Snoaring, in Norfolk, belongs to the fifteenth century, but whether it was a native product is doubtful. At Wymondham Church, in the same county, situated in the Norman Arcade, there is a sedilla in buff terra-cotta. It is renaissance in design, and evidently of Italian origin, if not of execution; but the otherwise good effect is marred by unskilful jointing, which, by the way, could have been easily avoided. The constructive faculty of the man who designed, and perhaps modeled it, was not (as often happens in our own day) by any means equal to his other attainments. Good Flemish brickwork was done in the fifteenth century at Little Wenham Hall, and at the gateway to Hadleigh Rectory, both in the county of Suffolk. Hurstmonceau Castle, Sussex, with its seventeen octagonal towers and a machicolated gateway, was built in 1448. Our illustration being from a recent photograph, its present state of preservation appears remarkably good.

From Gwilt we find that "molded brickwork and terra-cotta were introduced for ornamental parts by Trevigi and Holbein towards the end of the fifteenth century. At Layer Marney and other places bricks of two colors and highly glazed were used for variegating the surface, and were formed into lozenges. The chimney shafts seem to have exhausted invention in the twisted and diapered patterns into which they were wrought and decorated with beads, and capitals, and cognizances of the founders. The gateways were prominent features in these edifices, and most expensive ornaments were lavished on them. That at Whitehall, designed by Holbein, was constructed with differently colored glazed bricks, over which were appended four large circular medallions of busts, still preserved at Hatfield Peveril, Herts. The gateway contained several apartments, among which not the least remarkable was the study wherein Holbein chiefly received his sitters. The gateways at Hampton Court and Woolterton were very similar to this." Hampton Court Palace itself, that involuntary gift from Wolsey to his irate master, as a sop to Cerberus — where Edward VI. was born, and Jane Seymour died, and Katharine Parr became the sixth wife of the royal Bluebeard — where Mary spent her honeymoon with Philip of Spain, afterwards the favorite residence of Charles I., and later still the permanent abode of William and Mary — is built of brick. In the tower remain the busts of the Cæsars in terra-cotta, presented to "the butcher's son of Ipswich," by Leo X., with others, in the first court, said to be the work of Lucca della Robbia. Here, also, we have the most varied assortment of brick chimneys to be found anywhere. There are circular and square, spiral and multi-angular, with multitudinous diapers, but, if our memory serves us rightly, no two of them are alike. For such as these the poet has furnished a description which, if less prosy, is quite as explicit as the average specification: —

> "Quaint, fantastic chimneys with their store
> Of twisted, carved, and lozenge-shaped devices."

Two brick houses came into prominence in the year 1558, and have remained there during the three intervening centuries of England's extraordinary territorial growth and industrial development. These are St. James' Palace, London, and Hatfield House, Hertfordshire, the latter the ancestral home of the Cecils, and of the present Marquis of Salisbury. Their architectural importance is lost in the teeming historical associations that cluster around them. In one lay Mary, the daughter of Catherine of Arragon, from whose death chamber the attendants made a hasty exit, and the courtiers as hasty a visit to Bishop Hatfield, under whose hospitable roof the daughter of Anne Boleyn awaited the news of her succession to the throne. During the prosperous reign of "the good Queen Bess" brick came into very general use in the modified Tudor Gothic, to which was

given the name Elizabethan, by which it has since been known, and which in her own time was aptly idealized by Spencer in the "Fairie Queene": —

"High lifted up were many lofty towers,
And goodly galleries far overlaid,
Full of fair windows and delightful bowers,
And on the top a dial told the timely hours."

The Lollards Tower of Lambeth Palace is a venerable pile of ancient brickwork that may be cited as a connecting link between

THE ALBERT HALL, KENSINGTON, LONDON.

the picturesque past and the utilitarian present. It stands on the Surrey side of the Thames, midway between the handsome pavilions of modern brick comprising St. Thomas' Hospital, a little lower, and the great Lambeth Potteries, a little higher up the Albert Embankment. To both of them it seems to nod encouragingly, as if to convey an archiepiscopal approval from His Grace of Canterbury for the meritorious though widely different work in which each of them is engaged. The palatial headquarters of Sir Henry Doulton is one of the most noticeable architectural features that meet the eye in a view to the southwest from Waterloo or Westminster Bridges. The design is the personification of bold and vigorous outline, and, being executed wholly in brick, terra-cotta, and enameled stoneware, it is in itself a very commanding exhibit. Though representing but a few of the branches of this firm's multifarious clay products, it affords, on closer inspection, an impressive object lesson in constructional and decorative ceramics. The range of manufactures in clay carried on here embraces every conceivable style of sanitary goods, from pressed brick and vitrified drain pipes of enormous size to architectural terra-cotta, faience, and majolica ware; and from the common stoneware ink jars to the finest parian statuary, porcelain, and china bric-a-brac, such as were seen at the World's Fair and have not yet been forgotten. The well-earned and well-bestowed title conferred on the head of the firm, in the year of Victoria's jubilee, was a fitting recognition of his success in the revival and reunion of art and industry, conducted on business principles and sustained by commercial enterprise.

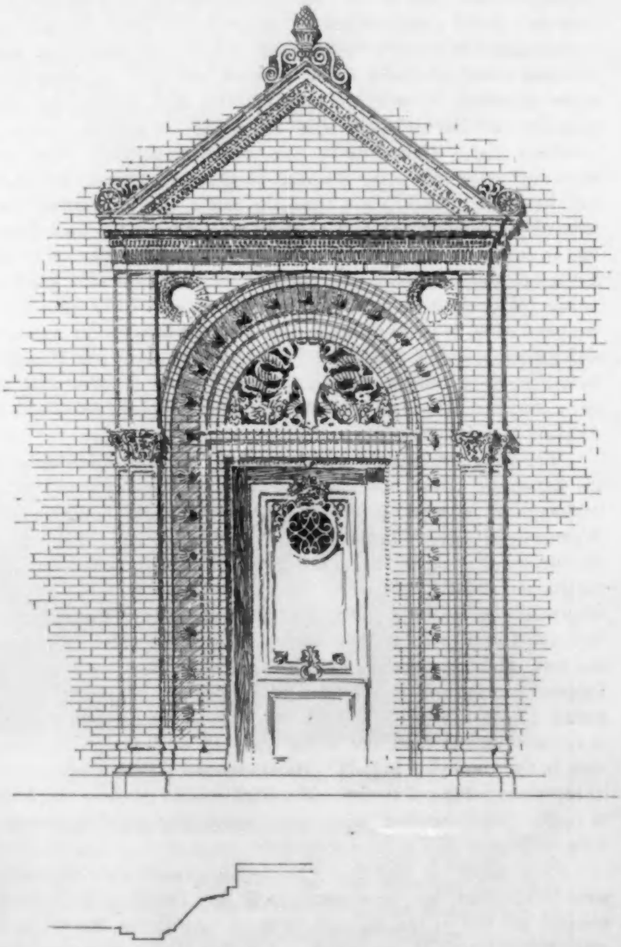
"The Release of Barabbas" is but one of a long series of Biblical subjects which have been depicted with dramatic force on imperishable terra-cotta during the past twenty years for which this firm is responsible, and by which the name of George Tinworth has become famous among sculptors. The genius, the devotion, and the deep religious sentiment embodied in their execution are inherent in the artist; but the resources and the opportunities necessary for their successful production were supplied by Doulton & Co. Without sympathetic encouragement and coöperation in his earlier efforts, the embryo artist might have languished in obscurity, as others have done. The world had then been so much the poorer in works of art and in forceful expositions of the scriptures, which in the estimation of competent critics take rank with those of Donatello Ghiberti and the della Robbias.

NOTES ON DESIGN OF BRICK BUILDINGS.

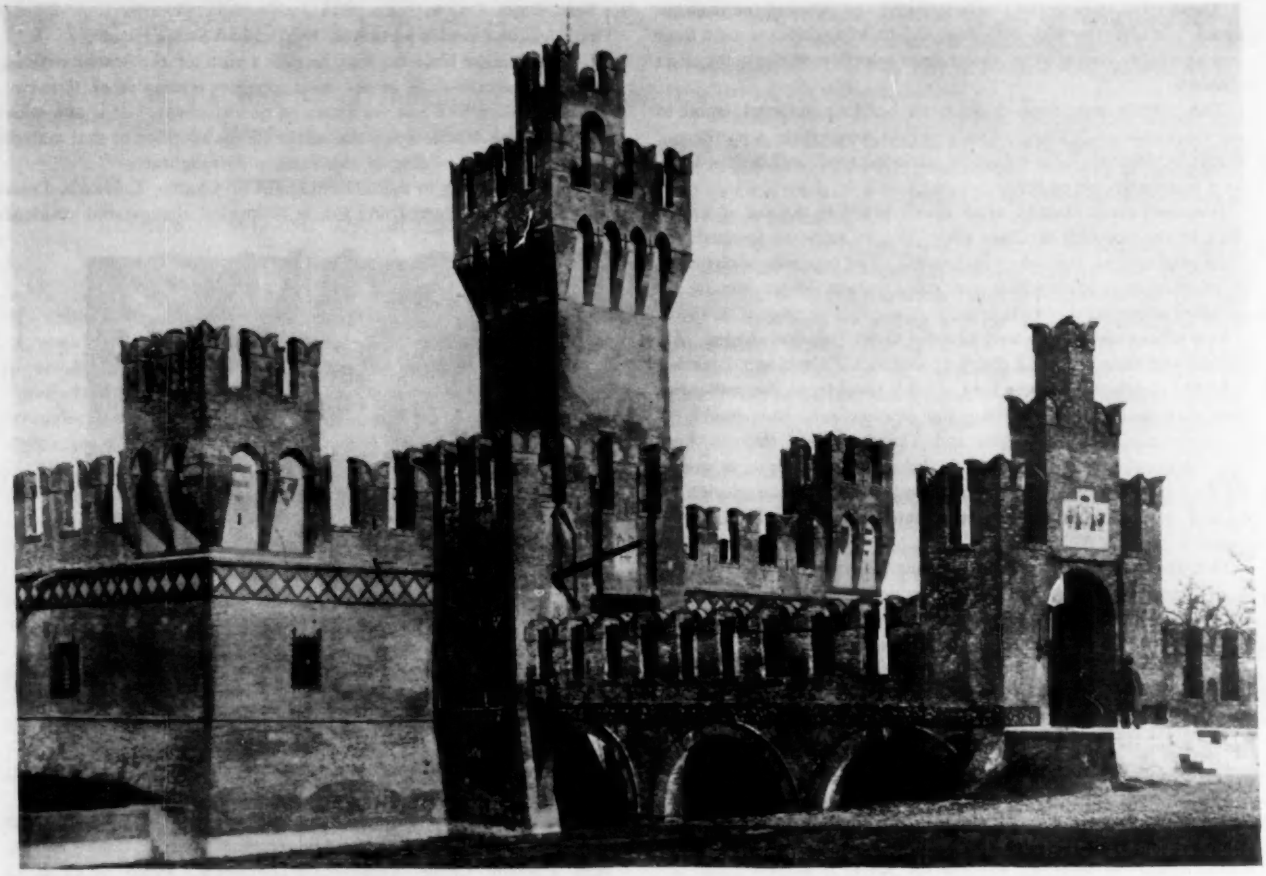
BY GEORGE F. NEWTON.

NEVER before in the history of building has there been at the disposal of the architect so great a variety of building material, especially in clay products, as at the present day. This fact is evidently appreciated, judging from our parti-colored streets. There is evidence of an earnest desire to make the most of these possibilities of material. We must believe that each effort is a serious one, and misjudged effects arise possibly from lack of observation of precedent or from a desire to be too ambitious and experimental on the part of the designer. It is said that much is learned from mistakes, but it is vastly more improving to do a really good thing, and architecture is too serious an art to experiment upon without some well-grounded principles, acquired through the study of precedent, in order to acquire a cultivated taste. An architect who has studied conscientiously the examples of successful buildings in which the world is rich ought not to do anything very bad, and such research will amply repay all the time devoted to it. It seems inconceivable that any man can cause to be erected a mass of material to be viewed daily, for scores of years, by his fellow-men, and not feel the responsibility that the opportunity puts upon him. The educating power of the architect is truly great, but the blind cannot lead the blind, and there is nothing like the study of precedent to open one's eyes. One cause of this apparent carelessness may be the lack of appreciation of what architecture really means, and of the fact that architecture is a matter of evolution to a great extent.

The true artist must feel a love for his art and possess the stay-



A BRICK DOORWAY.
Published by permission of the Philadelphia & Boston Face Brick Company.



A CASTLE IN THE NORTH OF ITALY.

ing quality which holds him to the design for a building through all its distracting details, done at various intervals. The ability to take up the theme after the interference of perhaps equally important work is indispensable to a successful result. He must feel the love for detail as well as the inspiration induced by the whole scheme.

This spirit is indispensable to the development of a creditable design.

A country may be never so rich in material, but without the artist's hand and heart it might better have remained in its natural state, where it cannot offend. This great variety of materials too often proves a stumbling-block. Some of our modern buildings look as if the designer used them for the display of various materials. During periods when architecture was at its best one kind of material was generally considered good enough for a building; at most, two. The saying that "There is nothing new under the sun" may, perhaps, in a general way apply to this subject. There are, however, many new methods under the sun in the way of applying and combining things which have long existed, in giving the old things a varied appearance. In truth, we can say that many things seem entirely new through this modern evolution.

It might possibly be better for our architecture if we had fewer variations in this list of building materials, as we might then learn to use properly a few good kinds, but experimenting is interesting and equally profitable, if we are discriminating and qualified to extract the goodness from each experiment, avoiding mistakes and treasuring the happy results.

In the course of these articles we will notice how bricks and terra-cotta have been employed in some of the buildings of the past and present. A review of this kind should be profitable. The discussion of any subject generally brings out ideas or throws new light on old ones. Every building must present a positive exterior. What this exterior should be depends upon the problem and the extent to which it lends itself to agreeable architectural treatment, which should be organic, as the logical solution of architectural problems almost invariably produces the best results. In modern buildings we cannot always be too logical from the point of view of past standards. Present methods of construction will not stand this criticism. Le Duc would say that many of our structures had no "style"; yet these constructive methods must be recognized, as their use is expedient. If it is the duty of the architect to utilize modern methods and materials to accomplish certain results in the most consistent and beautiful manner, he must make it good logic and turn present methods to account, and if he fail in the result there is more censure due him than he is willing to acknowledge. The nature and uses of the building and its location generally suggest the kind of material to be used. We are speaking of the customary modern architectural practise. A condition which the architect must accept, viz.: clothing his building in many cases with not only a better quality or different colored material, but one entirely different from that used in its structural portions. We are so familiar with these conditions that we have almost ceased to question their sincerity.

The artist will decide upon his material in part by the position his structure will occupy. He will study the site, with its existing surroundings, and, if he is happy in his choice, will select a material which both in color and texture seems best suited to the environment. A building should harmonize with its neighbors, either by quiet continuation of the prevailing tones or by a telling contrast. If the building is one of public character, it demands an individual treatment, using the possible somber surroundings as a setting for its more brilliant façade. A residence or structure of a private nature seems in better taste when it takes its place unostentatiously and does not seem to demand attention.

These effects are greatly influenced by the color of the material selected. Many otherwise well-designed buildings do not take their places agreeably, owing to an unfortunate selection of the color of its surfaces.

For certain conditions there is no building material equal to stone, if appropriately used. The architect may create a parthenon, a Mount St. Michele, or a village of quaintest type, and each will remain a monument for all time.

However, many reasons arise which prohibit the use of stone. In fact, in the majority of cases stone is put aside as inexpedient, and the products of clay are substituted. The expense or the difficulty in selecting a stone which can stand in our severe climate or some other objection throws it over.

Few stones seem to be well adapted to our business streets. All soil badly and soon present a dingy appearance. Granite, no matter how highly enriched, seems to turn a cold shoulder to the passer-by. Certain marbles are more inviting and weather well, and should be more commonly used. Georgia, and Tennessee, and the red Vermonts are durable and handsome in color, and if architects would study their use, combined with bricks and terra-cotta, the glories of brick and marble architecture of past centuries might be reviewed in our streets.

The great mass of buildings in our cities are built of bricks. The architect feels that it is a safe material, and he can obtain almost any desired color effect, and he is pretty sure that brick will stay through fire and water and improve in weathering.

He can give his wall any desired texture, from the clean, highly finished surface of sharply made pressed bricks to the robust treatment afforded by the various common brick.

Every architect knows that surprisingly good effects can be obtained with very simple means, and, furthermore, the most satisfactory and pleasing effects are more often accomplished by simple means than by elaboration of material. Some of our modern buildings have been treated very effectively by the simple use of brickwork, by varying slightly the tone of the brick or mortar color in telling places. The manufacture of molded and ornamented bricks has been developing and has extended immensely the architect's field of possibilities. It is proposed to review in these notes as many examples as practicable of the past and present brickwork, and, if possible, discover wherein lie the merits or defects of these buildings, and, perhaps, suggest how agreeable effects may be obtained by using the various materials at our hand.

ILLLUSTRATED ADVERTISEMENTS.

THE adjoining illustrations are from a thirteen-story building just completed, on Broadway, Broome, and Mercer Sts., New York City, a perspective drawing of which was reproduced in our issue for September, 1895. Mr. John T. Williams is the owner, architect, and builder, and in each capacity we have to congratulate him on this, his latest, and, perhaps, most successful enterprise.

The terra-cotta was furnished by The New York Architectural Terra-Cotta Co., in connection with whose advertisement on page xxiii will be found a portion of the Broome Street facade.

In a future issue we hope to give a view of the whole building, which is certainly one of the most effective examples of terra-cotta construction which has yet appeared on Broadway. It is one which will do much to encourage and stimulate the adoption of that material in the future re-building of this famous thoroughfare.

On page xvii, in the advertisement of Charles T. Harris, Lessee of the Celadon Terra-Cotta Co., is illustrated the palatial residence

of Anson Phelps Stokes, Esq., at Lenox, Mass. H. Neil Wilson, Pittsfield, Mass., architect.

On the same page, in the advertisement of R. Guastavino, is illustrated the dome of Grace Universalist Church, Lowell, Mass., Wm. Chester Chase, architect. The dome, which is 70 ft. in diameter, is built upon the Guastavino Arch System.

SHRINKAGE OF TERRA-COTTA.

THIS subject, together with unpunctuality of delivery of blocks, are causes of perennial complaint with architects, but in the vast majority of cases both are due to architects themselves. This is a point which they will not admit, however,— at least as a general body. The working drawings are always late, and the blocks are always wanted before it is possible for the manufacturer to turn them out. This state of things cannot be remedied unless the manufacturer keeps a stock on hand from which the architect must be compelled to select. The latter will not have this at any price, except in regard to a few odd things; and when the building is to be made entirely of terra-cotta it is, naturally, impossible for the manufacturer to anticipate the design. One would have thought that such things were self-evident to the architect, but judging from recent utterances, that is not the case. To some extent shrinkage is no doubt due to the employment of bad earths, but the work is hurried too much to amend things. The architect must allow more time.

On the architect's part it may be urged that the client is always a long time deciding the actual lines on which the building is to be erected, and wastes no end of time in suggesting impossible amendments to the plans. Then, as soon as these knotty points are smoothed over, the client wants the building to be erected with lightning-like rapidity, and everything is all hurry and bustle. This, however, is not all. In approving the block plan and elevation, there are yet many minor points of design about which the client must be consulted, or he feels hurt. After sending sketches of details of terra-cotta ornament, the architect is frequently compelled to wait some time before they are returned — and the client unthinkingly imagines that the work is being proceeded with. An old unwritten proverb is "Would that we (architects) could do without clients."— *The Brickbuilder, London.*

Fire-proofing Department.

Conducted in the Interest of Building Construction to Prevent Loss by Fire.

ELECTRIC WIRING OF BUILDINGS.

BY F. E. CABOT.

IN these days, when every mercantile building must be provided with electrical currents for light, power, and the transmission of messages, and when the use of iron and steel for building is so rapidly taking the place of wood in large structures, the problem of arranging for such currents has presented to the architect and the electrical engineer a problem by no means easy to solve.

While much has been done in this direction, there can be no doubt that, in most cases, a satisfactory result is only reached by taking up the problem for the particular case entirely on its own merits and requirements.

Some of the difficulties are common to every building of "fire-proof" construction, and are results, in part, at least, of the materials and methods of work necessarily used in such structures.

It is fair to assume that the most important point to be considered is that the introduction of the necessary ducts and insulated conductors shall in no way interfere with the specific purpose which the use of iron, steel, and masonry in place of wood is intended to produce, *i. e.*, the construction of buildings, which, *in themselves*, shall hinder or even overcome the spread of fire.

Another problem which is the result of this form of construction, and which is no less difficult of solution, is the necessity of providing during the construction of the building for all the conductors of electricity which are likely to be needed.

In a building constructed with brick or stone walls and wooden flooring, where the partitions are of wood or of plaster on wooden stud and lath, it is likely that there will be hollow spaces in which, with proper protection, the necessary additions can be made, or else the conductors can be attached to the exterior surfaces without unduly disfiguring or injuring the building. Where, however, the walls, floors, and partitions are of solid masonry, and steel or iron supports are used throughout the structure, no opportunity for such additions as may be desirable presents itself.

A third difficulty which is probably less understood at the present time can be directly traced to the effect which the materials used for concrete and plaster produce upon the coverings of electrical conductors in their various forms. No doubt every reader of this paper has in mind cases which have come to his knowledge, either directly or through the papers, where the conduits placed in fire-proof buildings have been entirely or in part destroyed by the action of these materials, and it is also probable that he has no distinct idea of the chemical processes which accomplished this destruction and the means which may be taken to prevent such action in the future.

In several cases which the writer has met, these problems have all occurred and have not been solved in a thoroughly satisfactory manner, and he hopes in this paper to suggest, at least, improvements on the methods which failed to produce the desired results.

In providing against injury to the fire-resisting qualities of the building it is absolutely necessary that in the construction of ducts and conduits no additional flues be made by which fire may pass from room to room, or floor to floor, and for this purpose it is essential that all such passages be provided for in the original plans of the building, or, if added during construction, be built of the same materials as the partitions through which they pass. It is too often the case that they are cut out of the walls and covered or built with wood without "fire stops" at the floor levels. In this connection it must be remembered that all insulating materials which can be applied to the surface of conductors are, from their nature, inflammable, and that they may be set on fire by the heat of the currents passing over the conductors.

We thus have the possibility that an electrical defect may develop a fire in a duct or conduit which will spread through a large part of the building on the materials and contents of the duct itself, and that the fire will be increased by the electrical disturbance which the flames produce.

Where the ducts are made a part of the original construction there should be no difficulty in making them as safe as a chimney, but architects should remember that the whole value of this method may be destroyed by adding to their contents steam, gas, or drain pipes added as an afterthought.

It will probably be said that the iron-armored conduit now so extensively advertised will meet this particular difficulty successfully, but in buildings where large main conductors are needed, the difficulty of placing them in the conduit is considerable, and the problem of connections by no means an easy one. Furthermore, where a large number of these tubes are brought together at one point, it is necessary to remove so much of the masonry as to injure its fire-resisting qualities, and where the point of junction is in a ceiling a serious weakening is likely to occur.

This form of construction is also liable to objection under the second head, that is, that with only iron conduit the possibility of change which is so necessary is not always found. An iron conduit cannot be properly used for more than two conductors; now, for lighting and power purposes this means that only *one* complete circuit is provided by each tube, and no considerable change can be made, while with a proper duct it is possible to add materially to the carrying capacity of the original main conductors and to have reasonable space in which to make the proper connections, which, with the tube system, are, as a rule, made in small cut-out cabinets or pockets in wall or ceiling.

The proper system for buildings of considerable size would seem to be a combination of the two systems with ample ducts for the mains and iron conduit branching to every point where current might be needed, and containing the smaller circuits.

The use of space behind a movable cornice has been used with advantage in some buildings, especially for such wires as are intended to carry currents for telephone, telegraph, or signal work.

In dealing with this problem the aid of the electrical engineer can be of the greatest service, for, while the architect and the mechanical engineer are, from their training, prepared to produce a building suitable in other respects for the uses to which it is to be put, the problem of where and how largely the electric current is likely to be needed is one which, with the rapid advance of science in this direction, needs special training for its solution. Above all things, however, architects, property owners, and builders should bear in mind the fact that the amount of current used, for instance, in a large office building may be during parts of the day the equivalent of two hundred horse-power, and should, therefore, provide facilities for arranging the main conductors at least in spaces where they can be accessible, and where additions can, if necessary, be made. Such spaces when used, say, for ventilation, are not considered unreasonable, but it is the exception when owner or architect provides, without protest, a duct 2 ft. square for electric conductors.

In connection with the third difficulty,— injury to conduits and conductors by materials of construction,— two facts should be kept constantly in view. First, the disintegrating effect of an electric current on all metals and conducting materials, termed electrolysis, and secondly, the constantly increasing tendency to increase the speed of construction by the use of quick-drying plaster.

Electrolysis takes place in a greater or less degree whenever an electric current passes from one conductor to another in the presence, and is often confounded with corrosion or oxidization, which is produced by such moisture.

(To be continued.)

Mortars and Concrete Department.

Devoted to Advanced Methods of using Cements and Limes in Building Construction.

AMERICAN CEMENT.

BY URIAH CUMMINGS.

CHAPTER VI. (*Continued.*)

THE CHEMISTRY OF CEMENTS.

THE question of the presence of alumina in a cement, its action and influence on the quality, and its mode of combination, has also been the source of much discussion by the authorities. The presence of alumina is due to the fact that silica, without which hydraulic cement has not been produced, is not found in quantities sufficiently fine except in combination with alumina, *i. e.*, in clay. And so it may be said to be an unwelcome accompaniment to silica in the composition of an artificial cement, while in natural cement it is inherent in the cement rock, being combined with the silica.

It is both basic and acidic in its character. In its combination with silica, as in clay, its action is purely that of a base. In this condition of silicate of alumina it is not decomposed by heat, as is demonstrated in the production of fire-brick from that material.

Taken in a pure state, alumina will combine with lime, forming aluminate of lime, thus proving its acidic character.

Its combining proportions with silica and lime, considered separately, are as follows:

Silica	63.83	Alumina	32.67
Alumina	36.17	Lime	67.33
Totals	100.00		100.00

The author has been furnished some beautiful specimens of aluminate of lime by Prof. S. B. Newberry, who produced them in his laboratory, and states that "they were practically fused at a bright yellow heat. A low temperature compared with that required to produce Portland cement."

The basic character of alumina exceeds the acidic, but it is so feeble that it is not capable of forming salts with weak acids, while its acidic character is also feeble and can only form compounds with strong bases.

These peculiar characteristics of alumina have led to a variety of opinions concerning its true position in an hydraulic cement composition.

Many excellent authorities assert that in a cement both silicate and aluminate of lime are formed. While others maintain that silica combines with both bases, lime and alumina, forming bi-silicate of lime and alumina.

Some of the advocates of each of these theories claim that magnesia, if present, remains inert in the cement, that is, free and uncombined. While others maintain that it combines only with the silica and lime; while still others maintain that it combines with the silica, lime, and alumina, forming a triple silicate.

It has also been stated by some eminent chemists that after calcination all the constituents, silica, alumina, lime, and magnesia, are in a free condition, and that it is only by the application of water that silicates are formed, some claiming that silicate of lime and aluminate of lime are thus formed; and by others that by the application of water the silica combines with all the bases present in certain fixed proportions.

Neither of these advocates are disposed to admit that water combines with and causes the crystallization of silicates already formed by the agency of heat.

While the analytical side of the cement question seems to be fairly well understood, it is apparent that the synthetical side has been neglected.

That neither magnesia nor alumina is absolutely essential to the fabrication of an hydraulic cement has been well demonstrated; but each is present, in greater or less proportion, in all cements, and it is interesting to note the theories advanced by our leading authorities in regard to the perplexing problems attending the presence of these two bases and their mode of combination.

The views of Prof. DeSmedt on this question, also those of Prof. Cox, are clearly expressed in the quotations already given, from their writings.

Leonard F. Beckwith, C. E., New York, in his report on the "Hydraulic Lime of Teil," page 23, says: "The method of manufacture strongly influences the composition of limes and cements. At a high temperature, silicate of lime and the double silicate of lime and alumina are formed. At a low heat, the double silicate is not formed, and the alumina, acting towards the lime the part of an acid, produces aluminate of lime," and that "the latter is weak and the first element to become decomposed in sea-water."

Henry Reid, C. E., London, in his work on "Portland Cements," ed. 1877, page 151, says: "Alumina, when in excess in a clay, impairs the indurating value of the cement in the making of which it is used. Aluminate of lime possesses excellent hydraulic properties, but the temperature necessary for its formation is much higher than that at which silicate of lime is produced.

"If, therefore, a clay contains an excess of alumina, part of the silicate of lime will be overburnt before the whole of the alumina can enter into combination with the lime."

Prof. S. B. Newberry in "Mineral Resources of the United States, 1892," page 746, says: "Cement possessing hydraulic properties is always obtained when a mixture of carbonate of lime and clay, in proper proportions, is strongly heated. Although this operation appears very simple, yet the chemical reactions which take place in the burning and hardening of cement, and the chemical nature of the cement itself, are still more or less obscure. Le Chatelier has shown, perhaps conclusively, that the essential constituent of Portland cement, burned at high temperature, is a compound of silica and lime, probably of the formula $3CaO.SiO_2$. The alumina and oxide of iron of the clay appear, therefore, to play an unimportant part in the hardening of cement. Nevertheless, Le Chatelier failed to obtain the trisilicate on heating lime and silica together, a mixture of lower silicates (bisilicate) and free lime being always obtained. It is evident, therefore, that in order to produce complete combination of the silica and lime at the temperature of the cement kiln, some other substance, such as alumina or iron oxide, must be present to act as a flux. By fusion with the oxyhydrogen blowpipe, however, the writer has lately succeeded in bringing pure silica and lime into combination in the proportion required by Le Chatelier's formula, obtaining a product which showed all the qualities of good cement. It appears, therefore, that the possibility of making cement from silica and lime alone is only a question of temperature. As to the part played by the alumina and iron oxide of the clay, it is interesting to recall that Dr. Schott long ago found that the alumina in cement mixtures can be completely replaced by oxide of iron, or the oxide of iron by alumina, without injury to the resulting product. He thus obtained cements containing only silica, lime, and alumina, and equally good cements containing only silica, lime, and iron oxide, showing that alumina and oxide of iron act in a precisely similar manner.

"The exact way in which the alumina acts in promoting the combination of silica and lime is, however, still more or less uncertain. Le Chatelier considers that in the burning of cement the silica and alumina first combine with a small amount of lime, forming a fusible glass, and that this gradually takes up more lime, becoming more and more basic, and at the same time less fusible, until finally the all-important trisilicate, which is the essential constituent of cement, is produced. Le Chatelier has, however, shown that alumina and lime form exceedingly fusible aluminates, especially when the lime is

present in large proportion. In view of this fact, it seems to the writer much more probable that a fusible aluminate is first produced, and that this is then gradually decomposed by the silica with the formation of the trisilicate, the alumina finally remaining in combination with a comparatively small proportion of lime. Substantially the same view has already been advanced by Michaelis. Experiments now in progress under the writer's direction are expected to throw light on this interesting question. . . . .

"It is well known that in making Portland cement the proportions of basic and acid constituents (lime and clay) must be almost absolutely constant, the best results being obtained with from 2.8 to 3 parts of lime to 1 part of silica. In natural rock cement, if the magnesia be disregarded, the clay will generally be found to be very greatly in excess, the proportion of lime to silica not usually exceeding 1½ or 2 to 1. At the low temperature at which the natural rock cement must of necessity be burned, it is probable that the chief reaction which takes place is the combination of the alumina with the lime, and that most of the silica remains uncombined. The quick setting properties of hydraulic cement accord closely with the behavior of calcium aluminate, and indicate that the latter is the active constituent in cement made from natural rock. The progressive hardening of this cement under water and the great strength which it often ultimately attains may be explained by the gradual action of the amorphous silica present on the aluminate, an action similar to that known to take place between the silica of pozzuolana, slag, etc., and slaked lime."

(*To be continued.*)

EMERY is one of the few valuable rocks not yet produced in important quantities in America. Large amounts are yearly brought from Turkey and the Greek Islands, where it has been quarried since history began. Its wonderful properties were no secret to the ancients, who used it for cutting and polishing; but their methods of working are not certainly known. Curiously, modern schemes for mining this substance have made no progress, and to-day ledges of emery are heated by huge fires, and the hot rock cracked by douches of cold water, as in the days when Athens and Sparta struggled for Syracuse.

During the middle ages, and for many years afterwards, the properties of emery, while not forgotten, could not be utilized. The old art of working was lost, and ingenuity was unable to give useful forms to this intractable substance. It defied every effort. Slowly, however, emery came into use, first as a polishing and cutting powder, and later, in small grains, was attached to fabrics like a sandpaper. Means were then found to cement and mold its small particles into wheels. Emery wheels soon came into use, for their remarkable cutting properties proved at once the great industrial importance of the invention.

Years elapsed, however, before the *emery millstone* could be made; but at length this, too, was accomplished, and a practical emery stone was brought out in England. But later Yankee ingenuity improved upon this and produced the present successful Rock Emery Millstone, which is built up of large blocks of emery set in strong metal.

These millstones are able to grind anything. They grind fast, because the emery face is always sharp, and they can be run at high speed (not being damaged by heat), and thus would be capable of doing more work than any other form of grinder, even if the cutting properties of emery were less remarkable. Emery millstones are economical, because, while not much more expensive than other millstones, they are as much more durable, as emery surpasses other stones in hardness. Many new uses will doubtless be found for emery, which for ages has held to rocks the same unique position that the diamond has to gems; but probably it can take no more important place than that of the emery wheel and the emery millstone, — the one cutting and polishing in the shops the hardest surfaces, and the other grinding everything that can be ground to any degree of fineness, and with a new economy.

IN the King Building, at the corner of Milk and Broad Streets, Boston, the architect, William Whitney Lewis, having to build an iron staircase of several flights, and not wishing to use marble or slate treads on account of the comparatively large expense of the same and the more or less slippery quality of these materials after a little use, decided to have the iron treads made in shallow pan shape with ribs spaced about 2½ ins. apart in both directions with the tops of the ribs about one fourth below the rims of the pans; the pans were then filled with equal parts of best Portland cement and sharp sand trowelled down to a smooth surface. The treads thus made promise to be durable, are almost noiseless, afford a firm foothold and can be easily and quickly repaired or patched in case of wear or injury by accident; in case of wear in the middle of width of tread, only so much of tread as is worn down need be replaced; a marble or slate tread would, of course, have to be replaced with a full-sized tread.

A SPECIES of construction is coming to us out of the West which, while perhaps not answering all conditions, certainly is a very promising one and affords wide opportunities. The use of concrete in some of the California buildings, and to a very limited extent throughout some of the Eastern States, is novel, daring, and so far very successful. The scheme of a monolithic house built of concrete from foundation to turret has been experimented with a great many times. Much of the prejudice which exists in some minds against the use of concrete arises from the fact that the material has not been employed intelligently, and that a good building construction has suffered by being confounded with a poor system which uses the same basis. It is perfectly possible to build a structure which shall be fire-proof, light, strong, and relatively inexpensive by using concrete throughout with no more iron than is in the shape of a few twisted rods. For many purposes this construction is admirably adapted, and if it is used in the future as intelligently as it has been in the best instances in the past we may look for a large expansion in monolithic construction.

THE ESSENTIALS OF GOOD PORTLAND CEMENT.

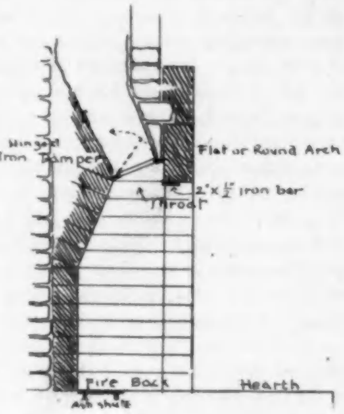
AT a recent meeting of the Society of Engineers a paper on Portland cement was read by Mr. D. B. Butler. The author stated that the chief chemical components of a good cement ranged as follows: — Silica from 20 to 28 per cent., average 24 per cent.; oxide of iron and alumina from 8 to 14 per cent., average 11 per cent.; lime 58 to 65 per cent., average 61.5 per cent. These ingredients constituted about 96 per cent. of the whole, the remainder being made up of small proportions of magnesia, sulphuric acid, alkalies, etc. With respect to soundness, the usual test is the molding of a thin pat with a minimum of water. This pat is allowed to harden on a glass slab, which it should do without cracking. This, the author states, is not altogether reliable, as he had known cases where, though the pat remained sound at the end of seven days, it went to pieces later on. He therefore advocated Mr. Faija's test, which consists essentially of subjecting a freshly gauged pat to a moist heat of 100 degs. Fahr. until set, and then placing it in warm water at 115 degs. Fahr. for twenty-four hours. A pat which stood this test without blowing showed a reliable cement. The edge-runner mills, which were now being largely substituted for stones, did not, he considered, give so large a proportion of the impalpable powder, which is the essential part of the cement, so that a cement ground by stones, and leaving a 10 per cent. residue on a 50 by 50 sieve, was equal in cementitious value to one ground in an edge-runner mill, leaving but half as much residue on the same sieve. From a number of experiments Mr. Butler concludes that the time of setting is less the higher the temperature. Some of the samples tried, when mixed at 80 degs. Fahr., set in half the time required at 40 degs. Fahr., and with other specimens the difference was even greater, and the result was of the same character whether the specimens were tested for initial set or for set hard.— *British Clay Worker.*

The Masons' Department.

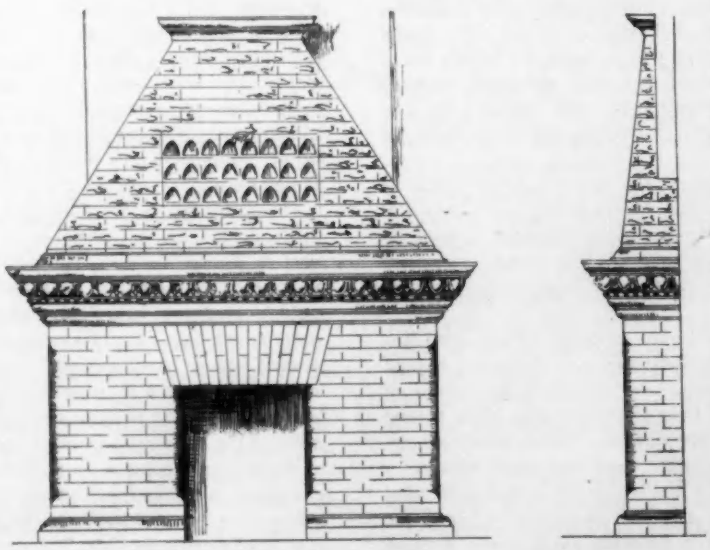
Conducted in the Interests of the Mason and the Contractor for Brickwork.

BRICK MANTELS.

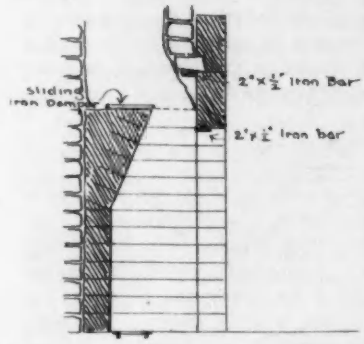
BRICK mantels and fireplaces have found much favor with home builders and also with owners of more ambitious buildings. Bricks are susceptible of such a variety of combinations that they may be made to express almost any desired effect of form or color. The same bricks which we see so aptly used in the mantel of a sumptuous town hall or library take their places very happily in the cozy home nook. Bricks are the most versatile building material in existence, and their use in the erection of the shrines of our homes seem a natural selection. The greater responsibility of the appropriate use of this subtle material in harmonious accord with its surroundings of course falls upon the designer, but also very much depends upon the mason who carries out the designer's ideas. All the beauties of form and color are set at naught when a fireplace indulges in the luxury of smoking. If the mason has not done his work well he may be the guilty party. At any rate, he should understand all the requirements of a healthy fireplace as well as laying it up in the most effectual and durable manner.



Many designs depend upon the technique, so to speak, of bricklaying; not only a skilful hand but a good head is essential to success in this branch, for the mason must know how to read a drawing and see around a corner, as it were, to imagine and supplement the data represented on a drawing with common sense, — and he must see what a drawing sometimes cannot express. A mason ought to be able to draw. The new Architectural Department at Harvard College has among its students several builders' sons who do not expect to be architects, but think that as builders they should have an architectural training. They will make the most intelligent builders. The prospective mason would do well to work awhile, at least, in an architect's office.



It may not be amiss to review the process of laying up a fireplace and mantel, calling attention to a few of the vital points. In the first place, the finished fireplace should under no consideration be built until the plastering is finished. A careful examination of the drawing is the first step. The rough chimney being already in place around which the finished fireplace is to be built, the mason should take measures and consider how his design will fit the rough work. If a serious amount of cutting of the rough work is necessary or any change required in the design, the mason should consult the architect if he desires a peaceful existence. In case of a low mantel or a brick facing, he will find, in properly constructed work, that the carpenter has built his furrings above the fireplace opening not lower than 4 ft. high from the floor. A rough brick fireplace opening is generally built 3 ft. 6 ins. high. He should investigate the supports and the trimmer arch for his mantel, and see that the former is sufficient and the latter wide enough, and if not, he should report to the interested parties. Although, strictly speaking, he has nothing to do with the smoke flue to his fireplace, he should have enough pride in the successful operation of his production when completed to examine if there is need of improvement of its accessories. A flue for a first-story fireplace, in the best work, is 8 ins. by 12 ins. plastered inside, or has a terra-cotta lining. A flue 8 ins. by 8 ins. for a small fireplace is often made to answer if perfectly smooth. For a second-story fireplace of a dwelling house, 8 ins. by 8 ins. is ample. A very large fireplace will require larger flues than here mentioned. Fireplaces vary to such an extent that it is not practicable to give any fixed rules as a guide. It is generally understood that the height of fireplace openings from 2 ft. to 3 ft. 6 ins. in width should not be more than 2 ft. 6 ins., or 12 courses in brick, and the depth 20 ins. The average fireplace, when wood is to be used, is about 3 ft. wide, 2 ft. 6 ins. high, and 16 ins. deep. The splay of the jambs depends upon the width of the opening. The width of the back should admit of the use of 2 ft. wood. It is advisable to give a very broad fireplace widely splayed jambs. For instance, if the opening is 4 ft. wide, make the back 2 ft., and the jambs would splay 1 ft. each. This permits the fire to radiate its heat and the splays act as reflectors, and the effect is also pleasing.

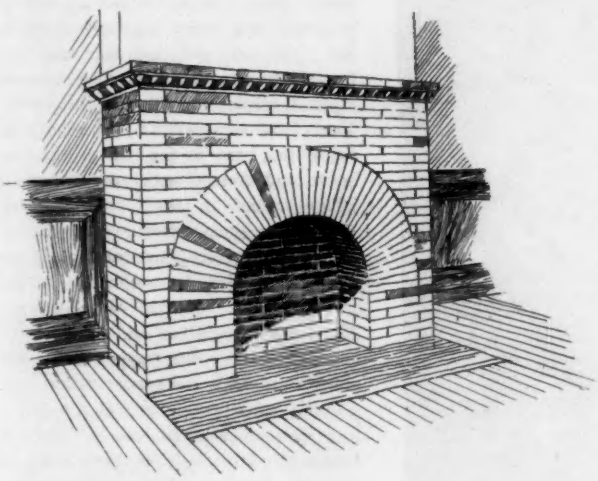


The rough work is first levelled up and the outline of the mantel and fireplace is drawn on this floor. In case molded or carved bricks are used this preliminary work should be very carefully done.

The catalogues of Sayre & Fisher Co., Fiske, Homes & Co., Philadelphia & Boston Face Brick Co., and Peerless Brick Co., contain illustrations of brick mantels with descriptions of same, that would be of much value to a mason wishing to post himself upon this subject.

The accompanying drawing shows a section of a fireplace. The hearth of bricks or tiles should never be less than 16 ins. width, this dimension depends upon the size of the opening. Hearths are more often built too narrow than too wide. The latter condition is to be desired. Two ft. is none too wide for a hearth for the common run of fireplaces. The hearth should extend at least 1 ft. each side of the fireplace opening. Black tiles form a good under

fire. Where an ash pit is provided, an ash door with cast iron rim is placed at the back of the fireplace. In laying up a brick facing the mason should give particular care to the joining of the facing to the rough brickwork above the opening. This is its vulnerable point. Defective work would perhaps permit sparks to enter the wood furring above. In best work an angle iron is used to support the lintel or flat arch above the opening, the iron being let into the under side of the brick, forming a flat soffit. A 2 in. angle iron is used for a 3 ft. opening and a 3 in. angle iron for a 4 ft. opening. The rough brickwork should also be supported by similar angle irons. There are several varieties of iron dampers in the market; the diagrams show two kinds, one resting on the brick shelf formed by the sloping back, which slides backward and forward to open and close, and the other hinges at the back with a register slide on the face. There can be no fixed rule for the size of the throat. It is commonly made from 6 ins. to 8 ins. in width and the length of the fireplace opening, a wide and deep fireplace naturally requiring a wider throat. Then a long flue with a strong draft would have a narrower throat. The minimum of throat area which will answer the purpose, of course, economizes heat. The thickness of the arch at the top of the opening should never exceed 4 ins. at the soffit. The top of the slope of the back should be level with this soffit, and inclining the damper forms a slight pocket which prevents the smoke



from curling out into the room. In a pressed brick mantel ⅛ in. mortar joint looks well. The mason should, however, space his vertical joints in case the top of mantel or of belts in his design are to line with any adjoining object. The mortar can be colored red by using colorific, or any desired shade, obtained by the use of earth pigments. A brick with white joint may not harmonize with the color of the room in which it is to be placed, but by coloring the mortar the tone of the mantel may be brought to harmonize with the decoration of a room. This is a matter of arrangement on the part of the designer, and the mason will do well to consult him before laying up the work. Cement is usually added to the mortar which takes away the whiteness of lime mortar. The hearth should always be laid in cement mortar.

After the mantel is finished its surface should always be washed with solution of muriatic acid and water.

NO one material is used so extensively in building operations as brick, and if experience were to count for anything, constant usage ought to lead to perfection in methods, whereas, the fact can hardly be denied that most brick masonry is laid in a manner which shows a lack of appreciation of fundamental principles on the part of our masons. There seems often to be a vague idea that if the bricks individually are well burnt and are laid up with a good bond, the wall is pretty sure to be a good one. The hardness of the brick and the character of the bonding certainly are important factors, but the weakness of the wall is more often due to the quality of the mortar and the manner in which it is used. The quality can be governed with pretty reasonable surety, and is a matter of good intent, but the good usage is in this country more honored in the breach than in the observance.

The best masonry construction which the world has ever seen was executed by the Romans. They were past masters in the use of brick, stone, and especially mortar, and their descendants of to-day keep up the old traditions, laying up walls of brick and rubble stone which, in respect to the use of the mortar, are hardly excelled anywhere. Their success lies in the use of the mortar which is employed very freely. In fact, the mortar is considered simply as a matrix and the stone or brick simply as a filling, so that the wall when completed is practically a solid mass of mortar with bricks or stones bedded in it at frequent intervals. With us the custom is apt to be just the reverse, — a brick wall consisting of an aggregate of slices of brick tied across at intervals with thin joints slightly filled with mortar. If the brick masons will once get the idea firmly bedded in their minds that the mortar is the principal thing in the strength of a wall, and not the brick itself, and could remember, furthermore, that it is of far more importance that every space should be filled solid with the mortar than that the joints of the brick should be absolutely even or especially small, there would be little difficulty in producing thoroughly first-class work.

The strength of a chain is measured by the strength of the weakest link, and the strength of a brick wall which is laid up in mortar can be no greater than the mortar itself no matter how hard the brick is. We are rather accustomed at times to consider the modern Italians simply as good laborers. If a few of the Roman bricklayers could be imported to this country and given the same opportunities they have abroad, they would lay up walls which would be a revelation to some of our bricklayers. Keep the bricks wet, slush in an abundance of mortar, and see that all the joints are filled and the bricks rubbed in, and, above all, carry up the different courses together, and a 12 in. brick wall built in this way will be stronger than a 20 in. or 24 in. wall put up in the usual manner. Even in a building of skeleton construction wherein the steel work is relied upon to secure the whole building, the character of the masonry is of great importance and the stiffness and durability of the envelope is affected a great deal by the manner in which the mortar is used. In other words, a brick wall to be thoroughly first class in its construction should be monolithic, like a mass of concrete, and the adhesive qualities of good mortar are amply sufficient to bring about this condition provided the joints are made thick enough and every space in the wall is filled full. Every specification calls for the joints to be well filled, and every foreman will claim they are filled, but we all know they are not.

In connection with this subject a practise that is very common among masons should be noticed. In setting plates for iron columns a level bed is usually cut on the top of the stone footing which is roughly brought to a little below the exact level at which the bottom of the plate must rest. A plentiful layer of mortar is then spread over the stonework and the iron plate is directly bedded therein. It is hard work to persuade most masons that this practise is wrong. If the plate is proportioned for the resisting strength of mortar no harm is done, but the plates are usually proportioned for the resisting power of the granite, and there is consequently interposed between the granite and the iron a layer, more or less irregular, of a material which has less than one fourth the resistance of the stone, and to make the matter worse in some cases the plate is even wedged up with slate chips if the mortar is a little thin on one side. The proper way is for the iron to bed directly upon the stone without any interposition, but we doubt if there are many buildings in which this is done. It is so much easier to spread a layer of mortar and fill up the space that only the most careful supervision and insistence upon the exact cutting of the stone will secure the desired result.

Recent Brick and Terra-Cotta Work in American Cities.

A Department Devoted to the Interests of the Manufacturer.

CHICAGO. — Hopes for the future are influenced by results in the past. With the incoming of the New Year, therefore, it is the fashion to balance the books and find out what has been accomplished during the year. The daily papers on New Year's morning were bulky with extensive reviews and statistics of all branches of industry, from pork packing to painting and sculpture.

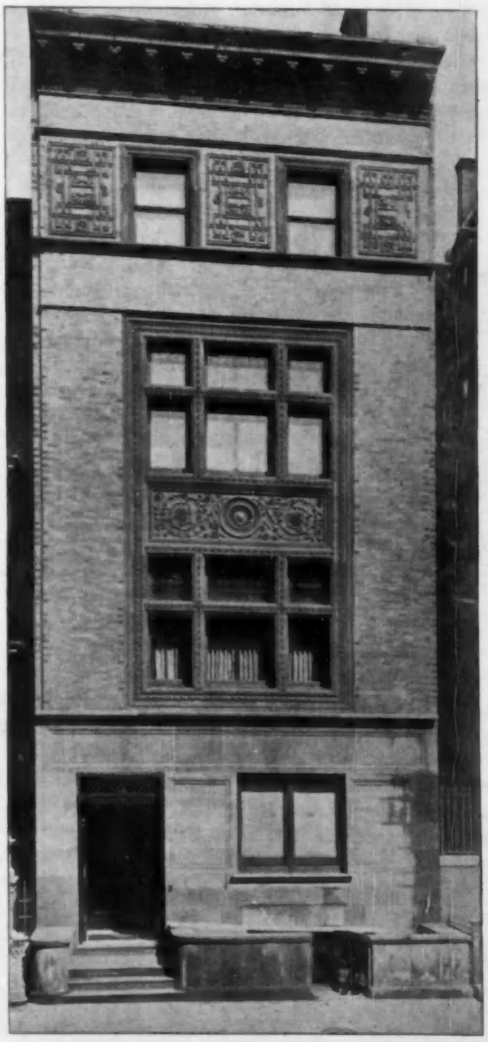
Building statistics in Chicago, like building ordinances, are not altogether reliable. Houses costing $4,000 sometimes go on the records at $2,000, and the total cost record may be 10 per cent. or 50 per cent. too low. The frontage of buildings erected in Chicago during 1895 is computed to be thirty-nine miles, a little less than in the preceding year, but in cost ($35,000,000) somewhat greater than the estimate for 1894.

Lumber statistics seem to agree with the above. Total sales in the Chicago market for 1895 are given as 1,760,000,000 feet against 1,626,000,000 feet in 1894. But that building activity since the panic is below the normal can be judged from the common brick consumption, which is said to be annually 800,000,000. In 1895 only 450,000,000 were used. The interesting thing about pressed brick is the fact that of the 30,000,000 used here last year only a small fraction were made in Chicago. No figures are at hand concerning terra-cotta and hollow tile, which Chicago supplies to herself and the country on a large scale. But even in this particular a few coals have been brought to Newcastle.

Of the quick building records during the year the Atwood is an example. Possession was given to begin tearing down the old building May 1. On October 1, five months afterward, the roof was on a ten-story building, and the first story was given over, mosaic floors and all, ready for opening a store. Another building was an eight-story structure, 125 x 100 ft. in plan, which was put up in sixty days for a bicycle factory.

The *Economist* makes the startling statement that it has reliable information to the effect that 90 per cent. of the buildings in Chicago are put up without the aid of recognized architects. This is a welcome statement as far as it helps to excuse architects for much bad work, but it is unwelcome if it is a correct statement of the respect and confidence which the profession has won for itself.

Speaking of prospective work in architecture, it is reported that the Czar Nicholas of Russia has ordered the erection of a Greek cathedral in Chicago which is to cost a half million.



BRICK AND TERRA-COTTA FRONT, 33D STREET, NEW YORK.
McKim, Mead & White, Architects.

J. J. Egan is the architect of a Catholic church to cost $100,000, and which is to have stone front and pressed brick sides.

There are two or three office buildings booked for the near future. Jenney & Mundie will be ready soon to let contracts on one of ten stories which is to stand at Randolph Street and Wabash Avenue.

A notable transaction lately was the purchase by a syndicate (composed in part of Holabird & Roche and a well-known contractor) of a tract of land at 34th Street and Cottage Grove Avenue, the site of the old University of Chicago. The improvements will be forty-four four-story apartment buildings, costing about $1,300,000. The buildings are to be isolated and will contain about 350 suites of two to eight rooms each. Back stairs will be enclosed and there will be hand lifts. The exteriors of the buildings will vary in design and be brick with stone and terra-cotta trimmings.

Mr. Richard E. Schmidt has been commissioned to design a $200,000 hospital for the Alexian Brothers, who have to leave their present quarters on account of the encroachments of an elevated railroad.

The Architectural Club had a good time one night before Christmas. Some of the veteran members tried to show the boys how to celebrate, and they certainly succeeded. The writer left at midnight and hence saw only half the fun. The first half had, as "soup," informal conversation and long-stemmed pipes (furnished and filled by the hosts). The "fish" came when a procession filed out to the barn at the rear of the club house and danced with ever increasing jollity around a fake Christmas tree. When the well-decorated guests marched back into the club house they found the parlors occupied by well-laden tables, and here they enjoyed the "entree." The supplies were fine and "unlimited," but enthusiasm never flagged until every platter was clean and every bottle empty. A little spice taken at this time with some salt was a poem read by the well-known German clay poet, Fritz Wagner. A "side dish" which became a center of attraction and loosened many tongues was a ruby stream flowing from a painted bowl, an ingenious and handsome piece of work by Mr. Mundie. Music wafted its harmonious influence over this many-coursed banquet, and, judging from all accounts, the "dessert" at 3 A. M. was highly enjoyed.

NEW YORK. — The year just closed has been one of the most successful in the history of building in New York. Owing to the cheapness of labor and material, and also, perhaps, to favorable changes in the building laws, a large number of plans were filed early in the spring, and the activity rather increased than abated as the year went on. A very large portion of these buildings have been of the steel frame type.

On Broadway and Anne Street George B. Post is building for the Havemeyers a twenty-five-story office building in the French style, of brick and cut stone. The foundations are now in, and they have an unusually solid look. An interesting innovation is intro-

duced in this construction. The steel columns of the exterior walls are placed entirely behind the brick piers, and at each floor there is projected from the columns a steel bracket to carry the I beams which support the curtain walls.

Another large building now in course of construction is the Siegel-Cooper building, De Lemos & Cordes, architects, which is to be one of the largest retail dry goods shops in New York. It is to be principally of brick, steel construction, with cast-iron uprights, and is to have a frontage of 180 ft. on Sixth Avenue, and 460 ft. on 18th and 19th Streets. The end system of fire-proofing is used. Some delay has been caused because possession could not be obtained of the small houses on the corner of 18th Street and Sixth Avenue until the leases expire in May; so that the part of the new work which is to occupy this site must remain undone until then.

Hammerstein's Olympia, recently finished, is one of the largest buildings of the year.

It is of very handsome white stone, profusely carved. It was designed and built by J. B. McElfatrick & Son, who have built a great number of theaters throughout the country, and has been rather severely criticized.

It is fire-proof throughout, faces on Broadway 206 ft., and 156 ft. on 44th and 45th Streets, and is 96 ft. high. It contains a large music hall, concert hall, and a theater, besides many lesser rooms for billiards, etc. There is also a roof garden, and a Turkish bath and barber shop in the basement.

J. Stewart Barney is the architect of an eight-story steel frame brick and terra-cotta building on 28th Street and Broadway. Peter Tostevin & Son are the contractors.

The Ireland Building, which collapsed so disastrously last summer, has been entirely removed, and a new building is being put up by Hill & Turner. Mr. Hill is a well-known engineer, and this time the building will no doubt be put up right.

MINNEAPOLIS. — There is almost nothing being done or even talked of for next spring just now, and it will probably be so for another month. There are rumors in the air, as is usual, at this quiet period, and they will assume definite shape by February 1st. Among the future improvements are a six-story wholesale block, approximately 200 x 200 ft.; several churches, school buildings, and it is given out that $50,000 will be spent in residence improvements at Linden Hills, which will be our finest suburb in a few years, beyond question.

Among the new projects already assured, and in some cases partially carried out, may be mentioned the following: —

Public library and dining hall at State Hospital, Rochester, Minn. W. B. Dunnell, architect.

Fourth State Insane Hospital at Anoka, Minn., after plans by W. B. Dunnell, of this city; estimated to cost $75,000.

Northeast wing of State Insane Hospital, at Fergus Falls, Minn.; 50 x 174 ft., four stories and basement, fire-proof throughout. Plans ready for estimating about Jan. 15, 1896. Cost, about $90,000. W. B. Dunnell, architect.

RESIDENCE OF RICHARD OLNEY, ESQ., BOSTON.
McKim, Mead & White, Architects.

St. Cloud, Minn., will probably build a court house in the spring to cost $100,000, the present building having been condemned by the grand jury.

L. M. Stewart, of Minneapolis, will build a public hall and library as a gift to his native town of Corinna, Me. Plans have been prepared by W. H. Grimshaw, architect, of Minneapolis, calling for a building 89 x 89 ft., two stories high, of brick, to be fire-proof, and to cost $35,000. The foundation is already in, and work will begin on superstructure in the spring.

Long & Kees are at work on plans for a three-story flat building, to be erected at corner Hennepin Avenue and 15th Street. To be of brick, with stone trimmings, and to contain thirty-six apartments. Plans ready for figures in January. Estimated to cost $60,000.

In St. Paul the following are reported: —

Public library for Michigan City, Ind.; 40 x 80 ft., two story, fire-proof throughout, to cost $30,000. Reed & Stern, architects.

Representative Kiefer will introduce a bill in the House, appropriating $200,000 additional for the new public building at St. Paul.

Architect Cass Gilbert says the capitol plans will not be ready for estimating before April 1, next.

Herman Kretz & Co. have plans for a flat building to be built on the hill; 42 x 81 ft., three stories and basement, to contain six apartments, and to cost $35,000.

DETROIT. — At this time of the year business, especially the building business, usually slacks up; but it is not so in Detroit this year.

Hardly a day passes but what some manufacturer drops into the city for the purpose of securing a site for a factory.

"I don't understand why people will talk about conservatism in connection with Detroit's unparalleled advantages as a manufacturing point," said a leading real estate dealer the other day.

"Within the last four years manufacturers with a combined capital of over $200,000,000 have begun industries in the salt district."

And I believe myself that there is not another spot on earth that can make the same showing.

Geo. T. Abrey will build a twelve-story hotel of fire-proof construction. Plans are now being gotten out, and the building will probably be started at once.

A $40,000 addition will be made to Walker's brewery.

The Detroit Photochrom Company, a new corporation, with offices in the Hammond Building, will build a $100,000 building in the western part of the city.

No plans have been ordered as yet, but works will be commenced as soon as the weather will permit.

District No. 2 will build a new school, to be constructed of brick, at a cost of $40,000. The new school will have twelve rooms.

Detroit is to have the biggest and finest Turkish bath establishment in the United States. Gabriel Chiera is the enterprising citizen who will build and operate it.

It will be built on Farren Street, opposite the public library; will

be seven stories high, of colonial style of architecture, and will cost about $150,000.

In its completeness it will be unsurpassed by any in the country, and, in fact, will be the only building erected exclusively for that purpose, with the exception of a small one on Murray Hill, New York City.

Architect Thomas Hyland is preparing plans of a Baptist church to be built in the city of Campos, State of Rio, Brazil. In ordering the plans, the pastor, the Rev. Solomon L. Ginsburg, specified that only brick and terra-cotta be used, as it is his intention to construct a modern building of the style of architecture used in the Northern States of North America.

The supervisors have at last settled the matter of building the new county jail.

The plans of John Scott, with certain modifications, were adopted, and all local builders will have an opportunity to bid on the structure.

The Bricklayers' and Plasterers' Unions asked that only union men and residents of Wayne County be allowed to work on the new rail.

Sam'l Goldwater made a speech in reply, and after he had finished the resolution was adopted.

The Detroit public building will have the finest court room contained in any of the federal buildings of the entire country.

W. H. Ashwell & Co., architects and civil engineers, have prepared plans for a large brick building to be used as an armory for the Michigan Military Academy. It will have a frontage of 150 feet by 50 feet in depth.

The Detroit Wheelmen hope to be installed in their handsome new club house by the first of August, which is to be built on Adams Avenue at a cost of $35,000 or $40,000.

TALL BUILDINGS

DEFENDED AGAINST THE THREATENED LEGISLATION LIMITING THEIR HEIGHT.

REFERRING to the "height of buildings," and resolutions proposed by the New York Chamber of Commerce anent the same, I have before me "A Law Limiting the Height of Dwelling Houses," passed in 1885. This was inoperative, because there was no penalty for any violation. The constitutionality of the act itself has not been tested. Men have always owned land from the center of the earth to the sky. Owners of property have common law rights and constitutional rights as well. The committee seems to think that the erection of "sky-scrapers" will outrun all limits of discretion.

But there is a law of "demand and supply" which is far more potent than any committee or resolution or legislative enactment.

No owner is willing to invest millions in a "sky-scraper" if all around his plot are similar ones which find "existence," or the income from rents, falling below the mark.

There are cases where a handsome bonus has been paid for the use of surrounding light and air to tall structures.

So that there is no fear we shall (here in New York, at least,) ever get too many tall buildings.

Now about the construction. The committee cites the Park Place Building as an example of what might happen in the future use of such tall buildings when loaded with machinery. But the conditions are not the same.

One was an ordinary wooden-beamed building, badly anchored and improperly loaded. The modern steel-cage construction is a rigid unit, all riveted together and possible to sustain vibratory motion without disintegration.

Much discussion has been quoted about danger from fire, outside as well as inside, the poor Manhattan Bank Building coming in as a "shining" example. But this never was, and never could be, classed as an example of fire-proof construction.

Iron alone does not constitute fire-proof construction. It must be scientifically disposed to accomplish this, and it has been so disposed in other buildings. There have been fires in these tall buildings (the "McIntyre" just comes to mind) where the fire has been confined to its primary limits.

Regarding the so-called defects of steel structures not being ascertained after enclosure in masonry, the committee has touched upon one of the strong points of steel-cage construction, because this system uses small members, each subject to rigid examination and test before leaving the shop, whereas cast iron may contain flaws which only assert themselves when failure comes.

It is a well-known fact that wrought anchors have been taken from the Coliseum at Rome, which were embedded in solid masonry, and when cut upon the anvil showed the same gray texture as when fresh from the forge.

Architects know how to protect their buildings from both fire and rust if the owners will pay for protection. But New York is an island and land is precious. In very few cases will a building below thirteen stories be found to pay, and its ability to do so is greatly dependent upon plan or convenience of arrangement, construction, and proximity to other tall buildings; this last cannot be accomplished by resorting to legislation.

Wind-swept as our great city is, there does not seem to be such a menace to health as the committee suggests.

Tall buildings will continue to spring up as long as there is a demand for them. What should be done is to eliminate the use of wood as much as possible, and where its use is imperative to so treat it that fire will not consume it. It is quite probable that owners of existing tall buildings might be glad to see a law enacted which should limit the construction of similar buildings. But this would be selfish, and as has been shown, difficult to pass. It is again reiterated that the needs and desires of the community will be found much more potent for its common good than ill-advised legislative restrictions.— *George Martin Huss in the New York Sun, January 10.*

THE new office building of the Mutual Life Insurance Company of New York that is to be erected on Chestnut Street, Philadelphia, will be built of cream white bricks, Roman shape, same being furnished by The Powhatan Clay Manufacturing Company, of Richmond, Va.

THE illustration published in our December number, as the Lincoln Town Hall, should have been entitled Town Hall, Billerica, Mass., of which H. Langford Warren and Lewis H. Bacon were the architects.

JAMES ANGUS BOYD.

TO such as knew him the death of James Angus Boyd comes in the sense of a deep and personal loss; for by his passing away there has been taken from our midst one whose association has ever been a source of benefit and help. Few, indeed, are there who by the closing of their life inspire the same heartfelt grief and keen sorrow. Not alone among those that kinship or kindred ties had brought in close connection, but extending to a far-reaching circle of acquaintances who were favored by his friendship or honored by his regard. Few, indeed, there are that have the same attributes of character which draw men to them as did he. Noble and kind, ever patient and considerate, always ready with heart and deed to help those less fortunate than himself. Loyal himself, and trusting others, he inspired among all who came within the broad circle of his friendship a deep and lasting regard. And, now that he is no more, he leaves behind the enviable reputation of a life that was not lived in selfish egotism, but, rather, one in which the precepts of noble manhood were everywhere evident, and the memory of which shall always endure.

Mr. Boyd was born in Rochester, N.Y., fifty-nine years ago, and in the early seventies came west to St. Joseph, Mo., where he became connected with brick machinery, as manager of The Kennedy Dry

Press Brick Machine Company. Later he invented the Acme Dry Press Brick Machine, and, finally, he became associated (in 1887) with Mr. B. C. White, and constructed the first Boyd Press. This machine brought fame and fortune to the inventor, and its reputation is known throughout this continent wherever bricks are made. In 1888 S. S. Chisholm entered the firm, and the partnership of Chisholm, Boyd & White was formed. In 1894 the firm was incorporated with Mr. Boyd as president, which office he held at his death on December 29.

NEW CALENDARS.

We are in receipt of a handsome calendar for the coming year from the Eastern Machinery Company of New Haven, Conn. This company is recently organized from the clay machinery department of the McLagon Foundry Company, as a matter of convenience in conducting the largely increased business of that department. The change is in name only, as the ownership and management remains identically the same as heretofore. The same character of machinery will be built with additional facilities, and the business policy will remain unchanged.

Samuel H. French & Co., of Philadelphia, manufacturers of the Peerless Mortar Colors, have issued a very practical and useful calendar of the memorandum pad style, there being one leaf to each week, with sufficient room opposite each date for memorandums.

F. W. Silkman, 231 Pearl Street, New York, importer of minerals, clays, chemicals, and colors, has issued a very handsome hanging calendar, at the top of which is an excellent half-tone illustration of one of our largest warships.

F. B. Gilbreth, 85 Water Street, Boston, sends us a "Water Tight Cellar" calendar that is very unique. Opposite each date is given the hours of high tide.

WANTED.

A salesman who knows the business to sell brick and terra-cotta in Boston and vicinity. Address P. W. I., care of The Brickbuilder.

INDEX TO ADVERTISEMENTS.